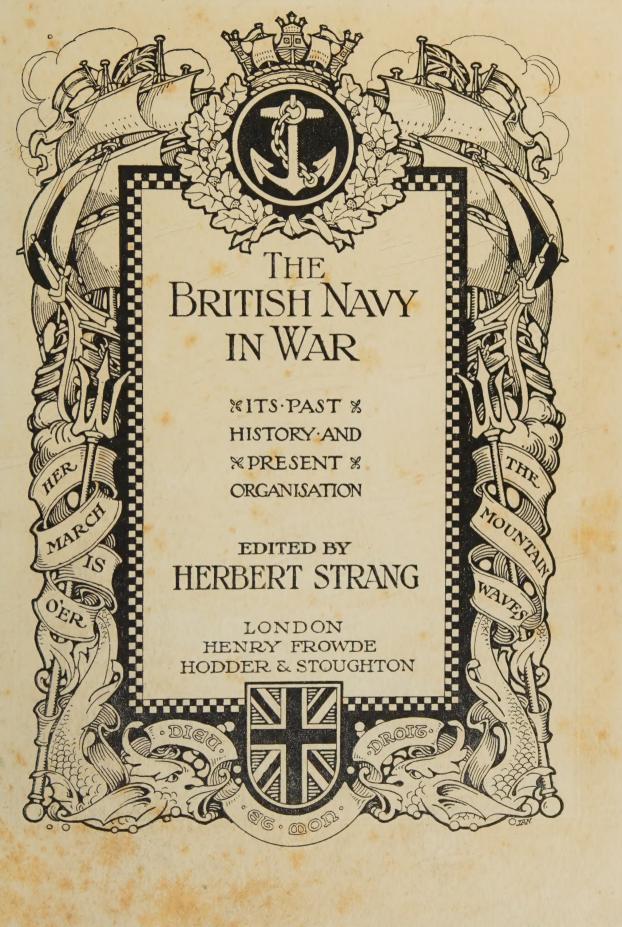


A BRITISH CRUISER CONVOYING MERCHANTMEN.

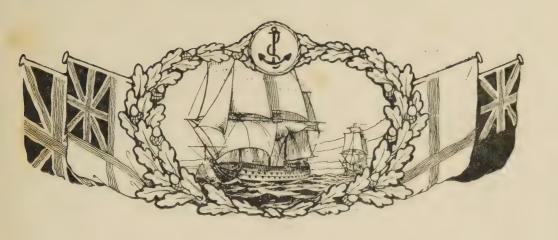




CHAP.

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LORD BEACONSFIELD was chatting with Prince Bismarck at one of the Imperial receptions that were held in Berlin during the period of the famous Congress. Being in a mild mood, they were discussing the pleasures of imagination. "What do you consider the finest romance that the world has ever seen?" asked the author of *Vivian Grey*. "The English on the sea," replied the German superman.

No Englishman will quarrel with the verdict; nor will its justice be disputed by even the descendants of the Scandinavian sca-kings whose adventures and exploits have figured in so many moving True it is that the sea has always been the home of mystery and the scene of daring enterprise, and that whether the farers on its billowy paths have been Phœnicians, Egyptians, Chinese, Arabs, Greeks, Carthaginians, Romans, Normans, Danes, Venetians, Genoese, Dutch, French, Spanish, Portuguese, or English, all nationalities have triumphed amid its dangers and known its wonders and delights. But it is equally true that the tale of English sea-power in the fascination of its spacious incidents and heroic episodes surpasses all other naval histories to the same extent that the British fleets ride in proud pre-eminence upon all the oceans of the world. Even if personal daring and desperate doing had been less in evidence, the features of Time and Space would themselves have led to the amazing result; for the sustained sea-effort of England has lasted during long centuries, and her flag has flown from pole to pole and in every sea within the wide ambit of the equator itself.

The beginning is veiled by the mists of ancient years. King Alfred the Great, that hero of glorious fact and shining fiction, is said to have founded the British Navy by regulating and organising the efforts of our coast towns to protect themselves against incursions from the sea attempted by Danes, Vikings, and Irish. This was in the latter part of the ninth century; but it was not until William the Conqueror established the Cinque Ports that a really national naval force came into existence. These ports were five in number, as the word "cinque" implies, and they comprised Hastings, Romney, Hythe, Dover, and Sandwich, all on the south-east coast of England; but, later on, Winchelsea and Rye were added. Each town was required to furnish and maintain a certain number of ships always in readiness for active service; and in return for so doing they were granted many special privileges connected with trade, industry, and matters of self-government. A high official, the Lord Warden of the Cinque Ports, was appointed to represent the King and the Towns alike; his duties consisting in seeing that the ships were duly provided and that the privileges and liberties of the towns were not infringed. Even now, although the Cinque Ports, with the exception of Dover, have long since ceased to exist as ship-building and ship-maintaining centres, and although the Lord Wardenship has become a sinecure, the historical appointment continues to be made (the Earl Beauchamp, K.G., is the present Lord Warden) and carries with it a salary of £3000 yearly, together with Wolmer Castle as an official residence.

The squadrons furnished by the several Cinque Ports formed the English fleet under the command of the King in person or some admiral appointed by him. They were supplemented by such vessels as might be voluntarily supplied by other coast towns, each of which vessels retained a general independence of action and was not amenable to the regulations and discipline prevailing in the "fleet" itself. Even in the event of an engagement with the enemy these auxiliary ships were free to attack or retire according to the individual judgments of their respective captains; and they could go prize-hunting or coast-raiding against the enemy (a word of elastic meaning in those days when it was sometimes applied even to the inhabitants of a rival English seaport) just as inclination might serve. They were, in fact, the equivalents of the priva-

teers of later ages, except, indeed, that they could take their station, with full effect, in a line of battle. This was because the warships of those days were all practically of one class and pretty much alike—galleys, propelled by the huge oars termed "sweeps," and depending but little upon sails. They were usually two-deckers, having a lower or "row-deck" where the men (commonly men sentenced by the courts) sat who handled the sweeps, and an upper deck with forecastle and poop which was manned by nobles, bishops, abbots, knights, and their several men-at-arms and retainers. arms employed were long-bows, cross-bows, catapults, and the like, while the vessels were still at a distance from each other, and swords, maces, axes, spears, halberds, and pikes when the galleys grappled and were held fast together. Seamanship, however, played a great part in these encounters; for the prow, rightly called the "beak," of each vessel had its cut-water fashioned so strongly and sharply as to bear being driven home against the enemy. A commander's endeavour, therefore, was so to handle his own craft as to frustrate any attempt at ramming or boarding by the enemy, and at the same time to acquire a position of advantage from which he might suddenly steer fore-and-aft along the hostile line of sweeps, breaking them and maining the rowers, or else might dart in athwart and cut with fatal effect through the enemy's side.

The first great naval engagement—the Battle of Sluys—fought (and won gloriously) by the British fleet, may also be said to have ended the above-described phase of the English navy. Edward III. (1327-1377) and, after him, Henry v. (1413-1422) paid very great attention to its development and organisation on a national scale and to its transformation into a fleet of ships depending mainly on sailing-power and able to keep the seas in all weathers. The age of Norman rovers, Danish galleys, and Irish corsairs had been succeeded by a period of commercial activity in England, Germany, and the Low Countries. Sailing-ships from the Mediterranean were making their way in increasing numbers into the English Channel and the North Sea, and stimulated the ingenuity and enterprise of English, Flemish, and German shipbuilders in the production of many types of merchantmen, that soon began to cover the oceanwaters of Europe, carrying forth the wool and other products of our land and bringing back the rich yield of the Orient and the fine

fabrics and wares of western and southern Europe. These peaceful traders were tempting baits for the sea-wolves of every nation, and were even an inducement to war in an age when war was not so costly as it is at present, and could often be carried on with a profit where rich booty was to be had. Accordingly, the rulers of England found themselves obliged to maintain sea-forces strong enough to protect English trade and to make a war with our island realm too destructive as regards the enemy's merchantmen to be lightly entered upon.

THE GREAT AGE OF DISCOVERY

Then came the great epoch of maritime discovery. America, which had originally been visited by the Northmen, was re-found by John Cabot of Bristol in 1497, by Christopher Columbus of Genoa (1435-1506), and by Amerigo Vespucci of Florence (1452-1512). The Cape of Good Hope, and thus the sea-route to the East Indies, was discovered in 1485 by the Portuguese navigator, Barthélemy Diaz. The history of mankind and the destinies of empires were changed, as it were, in the twinkling of an eye. borne commerce rapidly assumed the predominance which it has ever since assumed over every other form of mercantile activity. At first Spain and Portugal became the great merchant nations of the world, and the same necessity that had brought the English fleets upon the high seas into being was now experienced by the Peninsular powers. They not only built great galleons for trading with the vast countries of the Western Hemisphere and the Far East, but they also constructed great men-of-war to protect their trade and transport troops for the conquest and occupation of the distant El Dorados. But they had to count with mighty competitors who on the stormy waters of the North Sea, the North Atlantic, and the Bay of Biscay, had learnt the lessons of seamanship in a hard and rough school, and who were the lineal descendants of a sea-brood who had at one time devoted the main part of their lives to preying upon all nations that came within reach of their ships. The Free Cities of Germany, Holland, and Flanders were at one with the merchants of England in contesting the monopoly of Spain and Portugal. Ship for ship, and many more, were built and manned. Voyages of

discovery were made, and countries were found and seized in America, Africa, and the Indies. Then, indeed, were the days of romance; and it is much to be desired that in every English school every English boy and girl should be made acquainted with the deeds of English mariners in the brave times of Drake and his immediate predecessors and successors.

There could be but one issue to this stupendous activity. Commercial rivalry brought naval conflict in its train. Some single power had to emerge victorious from the strife and rule the seas. Spain set forth to be that power. Her naval architects produced the greatest warships the world had ever seen. Firearms and ordnance replaced the bows and arrows and other hand-weapons of former times, though these latter were still not entirely superseded, as may be seen by referring to the English Admiralty Lists—the "Dreadnought" of 1578, for example, being equipped, amongst other things, with "25 Bows, 80 Harquebusses, 50 Sheaves of Arrows, 50 Pikes, 60 Bills, and 40 Corselets." Still, speaking generally, it may be said that the warships of the period in question were sailing-vessels of large size and many decks, armed with numerous pieces of ordnance and manned (in addition to their sailing crews) with considerable bodies of troops equipped with firearms. When, however, they are here described as being "of large size," this phrase must be understood as in comparison with the vessels previously built for naval purposes. At the present day warships of the sizes employed in Drake's time would be regarded as practically of no account. Thus, the Great Harry, built in the reign of Henry VIII. (1509-1547), was the largest ship that had yet been constructed, but its displacement was only 1200 tons, i.e. less than one-third of the size of the English light cruiser Arethusa that took part in the Battle of the Bight.

THE SPANISH ARMADA

The naval struggle between Spain and England continued for many a long year until 1588, when it culminated in the famous and (for our own country) ever-glorious episode of the Spanish Armada. This great expedition, fitted out by Philip II. against England, comprised 129 ships, of which 65 were each of more than 700 tons.

The sailors numbered 8000; the soldiers were 19,000 of all ranks; the ships were armed with 2000 guns; and the stores carried included food, ammunition, and supplies of all kinds sufficient for maintaining an invading army of 40,000 men for six months. Never since the days of William the Conqueror had such a menace darkened the coasts of England. To meet it, Queen Elizabeth had only a fleet of 80 ships (for the most part smaller than the Spanish vessels); but they were manned by 9000 sailors as against the exiguous allowance of 8000 Spanish mariners in 129 ships, and among their admirals were the famous seamen Drake, Hawkins, and Frobisher, the heroes of many a victory in the Spanish Main. On 19th July the Great Armada was sighted off the Lizard coming up Channel in line abreast measuring some seven miles from end to end. Lord Howard of Effingham, who was the English Admiral-in-Chief, had prepared many fireships in addition to his fighting vessels, and had arranged a tactical plan, consisting essentially in avoiding a regular engagement and in hovering in all directions on the outskirts of the Spanish fleet, so as to cut off vessels that might lag or fall out of station, and to send in the fireships amid the enemy's main body at nightfall. Drake and his comrades gallantly and skilfully gave effect to their leader's design. They maintained a running fight, and gradually wore down the enemy by captures and conflagration, taking every advantage of their superior seamanship, which quickly became of greater and greater value as the weather changed for the worse. Finally, a violent gale, the like of which scarce any man had seen, descended upon the Channel and completed the disorder into which the Armada had been thrown by the desultory but incessant attacks of the English ships. The Spaniards scattered in all directions. Some of them even ran north to the Orkneys and made their way round Scotland into the Irish Sea, where they again encountered some of Drake's ships, and were forced to surrender. Less than a score ever reached home again; and sea-power became delivered over into the hands of England.

The very greatness of the triumph, however, brought with it fresh and formidable dangers. The Dutch and the French, who had witnessed the overthrow of the Spanish navy with much satisfaction, were not disposed to acknowledge England as mistress of the seas. France was acquiring rich possessions in North America,

the West Indies, and India; and Holland was doing the same in the Antilles, South America, Africa, India, and the Malay Archipelago. Both powers were developing a vast commerce with the New World and between the Far East and Europe. They were skilful shipbuilders; their sailors were hardy and experienced; their warships were well-armed, well-found, and commanded by officers of unsurpassed professional ability. They were not very much surprised at the defeat of the Great Armada, for they felt themselves capable of achieving a like victory under like circumstances; and therefore they saw no reason why they should not hold their own in the "seven seas" in spite of all England could do. If, indeed, they had acted in concert there might well have been a premature end to the British Empire then in making; but the English sovereigns and statesmen took good care to play off the French Government and the States-General against each other, and at the same time to develop the British Navy. This policy of stratagem abroad and preparation at home found favour with all parties, whether Cavalier or Roundhead, Monarchical or Republican, and in the end it approved itself as the sheet-anchor of England's fortunes.

WAR WITH THE DUTCH

The Dutch were the first to throw down the gage of battle, and when it was taken up by England the scales of Victory hung level for many a long year, and were laden with many a stirring episode. In 1677, indeed, a Dutch Armada actually invaded England by sailing up the Thames and Medway and setting fire to the shipping in the latter river; and the Dutch Admiral Ruyter patrolled the seas with a broom fastened to his masthead to signify that he had swept the Channel clean of the English fleet. As a matter of fact, however, that fleet was very much in being. Under the renowned Blake and other distinguished admirals, and manned by crews whose knowledge of sea affairs and indomitable courage has never been exceeded, it gave more than a good account of itself. Some defeats were sustained; but they were defeats without any loss of honour, for the Dutch admirals, captains, and men who carried off the laurels were foemen worthy of any steel, and it may be said with exactitude that during the whole of the naval war in question

both sides in every engagement agreed that the honours were divided. The two nations were friends at heart, and they took their respective drubbings good-humouredly; so that when, in 1688, England grew tired of the Stuarts and sent James II. to the rightabout, the Dutch William, who had married James's daughter Mary, was invited to come over and occupy the island throne. This cordial attitude may in part have been due to the fact that England's fleet had in the end achieved a decisive superiority over that of Holland; but it could hardly have existed had the two nations been inspired by feelings of enmity.

For nearly a century after the Dutch war the history of the British Navy was one of general supremacy and successful enterprise in all parts of the world. France was our only serious rival at sea, but she was beaten in many a fight, and failed to hold her own except in so far as she maintained her fleets in being without encountering any fatal disaster such as had overtaken the Spanish Armada. The case might have been different had the general administration of the English Admiralty been efficient. But the times were out of joint. It was an age of placemen, jobbery, and corruption in high places. Contractors and their patrons grew rich while our sailors were starved and neglected. Yet the old sea-roving spirit, handed down from fierce ancestors and fostered from generation to generation by the perils of the English coasts and the booty brought back to each seaport by the vessels it had sent forth in quest of adventures in distant waters far below the western horizon, was still strong in the blood of British seamen. Show them an enemy's ship to be riddled with shot and boarded, or an enemy's town to be taken by a landing party, reckless of every obstacle and danger. and they straightway forgot all else. Once again the whole scene of action of the British Navy was a region of lofty and thrilling romance.

OUR STRUGGLE WITH NAPOLEON

Then came the French Revolution, the rise of Napoleon, and the entry of Nelson into the great drama. The Admiralty, after well-nigh a century of maladministration and inefficiency, had felt the stirrings of a new life, and awoke to the conviction that a time of trial was at hand which would decide the fortunes of England.

New ships were built, and the best brains in the land were employed in improving the details of construction and equipment, and in developing the vast organisation of dockyards and other establishments required for maintaining the fleet in a condition of continual readiness and complete ability for discharging all duties which might be assigned to it. Discipline was made stricter, and officers were appointed with regard to their skill, experience, and power of quick, sure judgment rather than to their "protection" by the magnates of politics and society. Arms and ammunition were provided in adequate quantities, and of satisfactory quality, and inventors were no longer shown the door. The result of all this was, that although no great change had yet taken place in naval construction, and although ships and their crews remained, in general, much as they had been for the past hundred years, the fighting vessels under the English flag during the Napoleonic wars were by far the finest and most formidable the world had ever seen. They were fast sailers, and made "good weather" of all but the fiercest gales and heaviest seas. Their guns—smooth-bore muzzle-loaders—shot straight and true and were loaded and fired with what seemed magical rapidity to the sailors of other navies. In seamanship and gunnery the British Navy was unequalled, while in alert, intelligent action and sheer lion-heartedness, the British sailors stood in a rank apart. And, what perhaps weighed even more, they knew their chance had come—the chance for which the Navy had been waiting since the marvellous time of Howard, Drake, Hawkins, and Frobisher. Theirs was the proud duty to show that England ruled the seas and could successfully withstand a world in arms; and right faithfully they discharged it.

An enormous expansion took place in the numbers of the Navy. In 1800 there were no less than 900 vessels of all sizes in the British fleet, and by 1814, when the Napoleonic struggle virtually terminated (though Waterloo had still to be fought), the ships in commission comprised 177 ships of the line, 621 frigates, corvettes, sloops, and other smaller armed vessels, and 150 warships of various sizes in foreign stations—a total of 948.

The Admiralty, therefore, had ample forces at their disposal, and it only remained to employ them wisely and well. Fortunately for England, the First Lord, Bonham, was an accomplished naval officer,

and the admirals in command of the numerous fleets and squadrons were men in all respects qualified to uphold the honour and fame of the English flag. Foremost among them was Nelson, against whose merits as a naval chieftain there is but one thing that can be said, namely, that his effulgence was such as to pale the fires of the other luminaries. Yet he himself was at all times ready to admit that if it had not been for the loyal, unremitting work and unprecedented professional skill of the "band of brothers" his own decisive victories would never have been won; and the ultimate crowning triumph in which he lost his life bore witness to the truth of the generous statement.

The limits of space do not admit of any account being given of the wars themselves, in which, for some twenty years, the fleets of England were pitted against those of France, Spain, Denmark, and virtually the rest of the world, including even the United States of America. Suffice it to say, that the story, if told, would be a long succession of chapters narrating victories unchequered by defeats, and attended by two great results: first, the disappearance of all serious rivalry as regards Britain's lordship of the seas; and, secondly, the capture of territories in all the four quarters of the world to so vast an extent that the sun ceased to set upon the realms under British rule, and our little island became greater than Rome ever was even in the full plenitude and at the very zenith of her power.

THE COMING OF STEAM AND IRON

The effort had been supreme, and there ensued a period of reaction. More than half a century was to elapse before any nation ever even conceived the idea of challenging England on the seas. The British Navy felt the effects of security. Its administration was relaxed, its organisation was loosened, its equipment was allowed more or less to decay. But what mattered more than all this was the advent of steam-navigation. The "old salts" were roused to fury by the idea of having to depend upon "kettles" in place of sails. The British Navy prides itself upon its traditions and its conservatism; and the struggle lasted very many years before steam-power became recognised and accepted by the Admiralty. Even after the Crimean War (in which the English fleets were sub-

ordinated entirely to the land operations after Admiral Napier's failure to accomplish anything of importance in the Baltic), when Queen Victoria held a naval review at Spithead in 1856, our Navy still comprised 271 sailing-ships, carrying 9594 guns, as against 258 steam-vessels with 6582 guns. But by that time the inevitable had been looked in the face, and every wind that blew was sounding the dirge of the English sailor, who must shortly give place to the seaman-mechanic.

Another death was also impending. The glorious "wooden walls" of Old England were doomed just as surely as were her sails. Guns and projectiles had been improved, and naval architects were called upon to devise means that should prevent a warship from becoming a mere shambles immediately action was opened. It was found necessary to protect them by armour-plating, and this, in its turn, involved the abandonment of portholes and lower gun-decks, in addition to the vast increase of displacement required to give buoyancy sufficient for carrying the additional weight. The first armour-clad warship, the Warrior (6170 tons), was launched in 1860, and with it began not merely a new chapter in the history of the British Navy, but a new record altogether. The navy that had been founded by Alfred the Great, and had lasted without any fundamental change for something like a thousand years, died out and disappeared, though, of course, not instantly. Its dissolution required a period of forty years, that is, from 1860 to 1900; but with the commencement of the twentieth century the new navy may be said to have finally replaced the old. In all material respects nothing can be found that is common to the fleets of both Nelson and Jellicoe. The very problems of naval architecture have changed with the change from sails to steam, from oak to steel, from lofty to low-lying hulls, from gun-decks below to turrets, casemates, and barbettes above, and from guns weighing two tons to pieces of ordnance weighing one hundred tons. So, too, with the problems of speed, steadiness of platform for gunfire, watertight compartments, fuel-storage, electric equipment, and the like; these matters require new knowledge and new activities of both mind and body. And when we come to consider existing facts and near probabilities with regard to torpedoes. submarines, and aircraft, we can well understand that the naval officer of the present day is divided by a great gulf from the officer

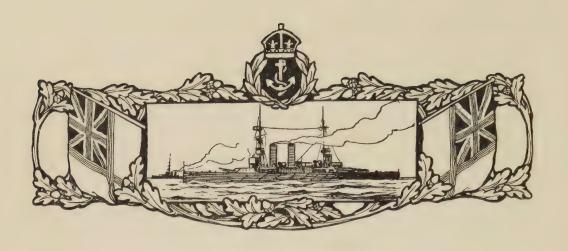
of Nelson's time, and has to depend upon his own experience instead of looking for lessons to the past. Yet it remains true, as a gifted writer has well said, that "men with honoured names such as Lord Fisher of Kilverstone, Admiral of the Fleet Sir Arthur Wilson, Admiral of the Fleet Sir Gerard Noel, Admiral Lord Beresford, Admiral Sir Cyprian Bridge, and Admiral Sir Reginald Custance, besides many other veteran seamen held in high honour by the younger generation of the Navy, received their training as youngsters in the wooden walls of Old England, ships which differed but very slightly from those by which they had been preceded in the brave days of old, the times of Nelson and St. Vincent. To these men and to their contemporaries in the Service, the country owes a debt of gratitude which it would be impossible to overestimate. Trained in the old school of seamanship, when the ability of a man to manœuvre his ship under sail was regarded as the primary test of the ability of a naval officer, they lived to see the wooden three-decker superseded by the monster steel battleship of to-day, witnessed the introduction of rifled ordnance, assisted at the birth of the Whitehead torpedo, and saw one by one the standards of their youth and early manhood disappear before the resistless sweep of modern mechanical appliances; so it came about that they strove during all their service careers with change such as all the zons of Time had never before witnessed. To sheer seamanship science had to be wedded; the craft of the old-time sailorman still survived for a time, but new conditions had to be faced as they arose. They had, in the first instance, to learn all these new things for themselves; they had, in the second, to impart this knowledge to the rising generation."

The new history of the British Navy, begun, as we have said, with the commencement of the present century, has been brief but eventful. It has seen the taking to heart by the Admiralty of the lessons taught by the Russo-Japanese War, and the consequent fundamental change of naval tactics by the adoption of actions at long range. It has seen vast developments in the use of mines and torpedoes, and the still more formidable creation of a fleet of submarine vessels. But perhaps the most startling incident of all has been the introduction of what, in the opinion of many men competent to judge, means the Navy's own disappearance at no very distant date. The aeroplanes and airships of the Aerial Service of

the British Navy have entered upon possession of the atmosphere. They dominate both land and sea. They can advance unscathed past any cordon of battleships or cruisers, and their offensive power is growing day by day. There are no mines or wire entanglements in the air, and when once a certain height is exceeded even the present immature flying-machines are safe from gun-attack. The British flight-commanders have already rolled back the veil from a future fraught with dismay to their comrades afloat on the waters of the deep.

However this may be, those comrades have, in the meantime, shown the same mastery of the new navy that characterised the handling by Nelson of the navy known to him. Admiral Sturdee's dash to the other side of the world, there to destroy Von Spee's squadron, was as keen and fine an exploit as was the Battle of the Nile itself. The part played by the Navy in the famous landing on the five beaches of Gallipoli was a more splendid triumph of organisation and gunnery than even the capture of Gibraltar by Admirals Sir George Rooke and Sir Cloudesley Shovel. We may regard with mixed feelings the change from old to new; we may lament that our tars no longer sail out to meet the foe in a fair and free fight with short-range guns, cutlasses, and boarding-pikes: we may turn with aversion from the scenes of mere mechanical slaughter: and we may, perhaps, glance with awe at the possibilities of the future. But in all and through all we have the abiding vision of the British seaman who now, as of yore, so holds himself that when he goes from us we are compelled, with Dibdin, to say of him:

His form was of the manliest beauty;
His heart was kind and soft;
Faithful below, he did his duty,
And now he's gone aloft.



THE famous Dreadnought commanded by Drake in the days of Queen Elizabeth was a wooden sailing-ship of 400 tons burden, and, as shown in the roll of the Navy for 1578, was manned by 10 officers, 80 soldiers, 20 gunners, and 140 marines. Her armament, in addition to "80 harquebusses" (matchlocks), comprised "25 bows" and "50 sheaves of arrows."

The Dreadnought of to-day is a steel-built, steel-armoured steam-ship of 17,900 tons, manned by a complement of 770 officers and men, and armed with 12-in. guns weighing 50 tons apiece, and capable of propelling an 850-lb. shell through 19 inches of Krupp steel at a distance of 5000 yards (23 miles).

And even if we go back merely to the time of Nelson for our comparison, the difference between the days of old and the present time is hardly less striking. The renowned *Victory* was launched in 1765, and was a wooden sailing-ship of 2162 tons, armed with 104 guns varying in size from 12-pounders to 32-pounders. The total weight of shot that the *Victory* could discharge from the whole of her 104 guns in a simultaneous double broadside to starboard and larboard was 2320 lb., or less than can be fired from three of the modern Dreadnought's guns.

Facts such as these show how naval warfare has changed since the days of Drake and Nelson in respect of what may be termed ship-power, including size, speed, independence of weather conditions, and gunfire. And there are other changes still more striking.

Battleships can no longer be captured by boarding, and the British sailor has thrown aside the pike and cutlass with which he was wont to win so many triumphs. It may, indeed, almost be said that he has ceased to be a sailor, now that his ship is moved by steam instead of being urged forward by swelling canvas rising white and wing-like to dizzy heights in the air. Nor is he called upon to face foes of flesh and blood fashioned like himself and capable of dealing shrewd blows that can be parried and returned, or borne with the satisfaction that comes of a fair tussle hand to hand. Even when the fatal billet was claimed by bullet or cannon-ball, the seamen of the Nile and Trafalgar were at least able to see the foe who fired upon them, and to exchange with their adversaries the breezy shouts of challenge and rough gusts of defiance that stir the blood and bid a bold greeting to death. But now, long miles of ocean lie between the opposing crews in a sea affair; the only voice that is heard is the roar of the gun or the crash of the exploding shell: the grim appeal of the fray is to endurance rather than to momentary ardour.

So, when we try to understand our Dreadnoughts, and their part in the Great War, we must dismiss from our minds all pictures of the past, and must recognise that sea-power has become a matter of chemistry, engineering, mechanics, and scientific direction, rather than of human prowess. This does not imply that Jack of to-day is one whit less of a hero or less of a skilled seaman than was Jack of the stormy vigils off the coast of France. He is called upon, indeed, to do more and bear more than has ever hitherto been the task of any sailor in the whole history of the seas; and right nobly does he answer the call. Long-range guns, high-explosive shells, mines, torpedoes, and submarines—these in their present developments are perils far more prodigious and awe-inspiring than were ever before encountered by the British (or any other) Navy in all its thousand vears of battle and the breeze. We who sit at ease in our homes ashore are wholly unable to realise what the crews of our warships have to face in the long hours of waiting and watching even more than in the quick minutes of the battle's storm. All we can do is to look into our hearts and find there a humble acknowledgment that the spirit of British heroism may still be seen upon the face of the wide waters.

CLASSES OF BATTLESHIPS AND "TYPICAL" SHIPS

What is meant nowadays by a "Dreadnought" is a heavily-armoured ship of great speed, and carrying a main armament of big guns. This may seem a definition that applies to battleships in general, and also to heavily-armoured cruisers. Such is, indeed, the case; and it arises from the circumstance that "Dreadnoughts" are not Dreadnoughts. It is the practice in the British Navy, and in other navies as well, to build what are termed "typical" ships, representing such advances, or changes, in design, construction, and armament as may be decided on from time to time, and then to follow up each of these ships by a group of similar vessels, designated generically by the name of the type-craft, though, of course, having individual names of their own.

Thus in 1899 the Canopus was completed, and became the type of a class consisting of the Goliath, Ocean, Glory, Albion, and Vengeance, all of which were 12,950-ton ships, with 13,500 horsepower, a speed of 18½ knots (21.3 miles) per hour, and an armament of four 12-in. and twelve 6-in. guns. The next typical ship was the Formidable, completed in 1901, which had a displacement of 15,000 tons, 15,000 horse-power, a speed of 18 knots, and the same armament as the Canopus. It gave its name, as a class appellation, to the Implacable, Irresistible, Bulwark, London, Venerable, Queen, and Prince of Wales. There followed, in 1903, the Duncan, of 14,000 tons, 18,000 horse-power, $19\frac{1}{2}$ knots ($22\frac{3}{4}$ miles) speed, and still the same armament; the class thus constituted being composed of the Albemarle, Russell, Exmouth, and Cornwallis. By this time "the controversy of the guns," as it was called, had become fully developed by reason of the naval engagements in the Russo-Japanese War. One set of experts pleaded for the heaviest possible blows, even though comparatively few in number, while the other set advocated a torrential rain of shells, even if of relatively small size. As a compromise it was decided to retain the four 12-in. guns, to reduce the number of 6-in. guns from twelve to ten, and to add four 9.2-in. guns. This, with an increase of tonnage to 16,350 and a corresponding decrease of speed (the horse-power remaining 18,000) to 18½ knots, was adopted in 1905 in the King Edward VII., which became the type-ship of a class comprising the Dominion, Common-



SHIPPING A SEA.



Bows of a Warship pluncing through the Sea.



wealth, Zealandia, Hindustan, Hibernia, Britannia, and Africa. But before the compromise had lasted a year, the all-big-gun school, headed by Admiral Sir John Fisher (now Lord Fisher), who became First Sea Lord of the Admiralty in 1904, gained the day, and in 1906 the Dreadnought was completed. Her tonnage was 17,900, her horse-power 23,000 (with, for the first time, turbine engines), her speed 21 knots (24·18 miles), and her armament consisted of ten 12-in. guns. She had no secondary armament whatever; though, as a protection against torpedo-boats, she carried twenty-four 12-pounders and five machine-guns.

And now a curious fact is to be noted. The Dreadnought was hailed throughout the world as a typical ship par excellence. It was loudly proclaimed, at home and abroad, that "from the moment she took the water all other battleships became déclassés"; and foreign critics even deduced the conclusion that we in Britain thereby had lost our supremacy, and had, by our own deliberate choice and doing, started level in the race with the navies of other nations who at once began to build "Dreadnoughts." The result has been that ever since 1906 the computation of naval power, so far, that is to say, as battle-strength is concerned, has taken place in terms of "Dreadnoughts." Yet no Dreadnought other than the original vessel has been constructed; and therefore no class of "Dreadnoughts" properly so called has ever existed.

What happened was that at about the time of the Dreadnought's completion a great development took place in the offensive power of the torpedo. The effective range of this weapon became very greatly increased. It was therefore no longer necessary for torpedoboats to approach closely in order to attack a battleship; and it consequently became needful for the latter to be armed with "antitorpedo" guns of augmented efficiency. Furthermore, torpedoboats were not the only swift craft to be feared in this respect. Torpedo-boat-destroyers (the T.B.D.'s or, as now, the "destroyers") and light cruisers were being constructed, having speeds of 30, 35, 40, and even more, miles per hour, and were provided with torpedoes in addition to light guns. Against such craft the primary armament of big guns was too cumbrous in movement and too slow in action. A quick-firing secondary armament was required; and for this, in the British service, it was decided to adopt 4-in. guns firing 25-lb.

shells. The Bellerophon, completed in 1909, was the first "typical" successor of the Dreadnought. She was of 18,600 tons, with 23,000 horse-power and 21 knots speed, and was armed with ten 12-in. guns and sixteen 4-in. guns; and in her class were built the Temeraire and Superb. Then came, in 1910, the St. Vincent (with the Collingwood and Vanguard), in which the tonnage was raised to 19,250, the horse-power to 24,500, and the number of 4-in. guns to 18; while the speed remained at 21 knots. A single "type," the Neptune, followed in 1911 with a tonnage of 19,900, and 25,000 horse-power, but with only sixteen 4-in. guns. The Colossus and Hercules, both completed in 1911, were similar to the Neptune, with the exception of the displacement, which became 20,000 tons.

In 1912 there began the era of what are called the "super-Dreadnoughts." This name was given to them because they were larger and more heavily armed than the original *Dreadnought* and the vessels of the succeeding classes we have mentioned. The *Orion* was the first typical super-Dreadnought. She was of 22,500 tons, with 27,000 horse-power and 21 knots speed, and was armed with ten 13.5-in. guns instead of 12-in. guns; her secondary armament, however, still being sixteen 4-in. guns. Later vessels continued the progress until during the first year of the war the mighty *Queen Elizabeth* made her appearance, displacing 27,500 tons, being driven by turbine engines of 58,000 horse-power at a speed of 25 knots (28\frac{3}{4}\text{ miles}) per hour, and carrying an armament of eight 15-in. guns and sixteen 6-in. guns.

Mounting and Firing Big Guns

The problem of how big guns can be most effectively mounted is, of course, one that has to be closely studied in the case of battle-ships. By the device of mounting the guns in two stages, each tier can be traversed (that is, can be swung round horizontally) without interfering with the other, thereby saving much of the space that would be required if the guns were mounted side by side on the same level. Also, by placing the guns in turrets, they can be traversed through an entire semicircle; so that it is possible to bring the entire primary armament to bear simultaneously in the same broadside if desired. And by grouping the guns in pairs

which are automatically directed on the same target and simultaneously fired, the ship, fort, or other object aimed at is subjected to a blow equal to that deliverable by a single gun having twice the power of the 15-in. What this means may be guessed at if we reflect that the 15-in. gun throws a shell weighing 1950 lb., or nearly a ton, with a velocity of more than 2000 ft. per second; and we need not wonder in the least at the accounts we received of the devastation caused when the *Queen Elizabeth* took part in the bombardments of the Turkish positions at the Dardanelles. With regard to this, a German officer has written—"One ship of the *Queen Eliza-*

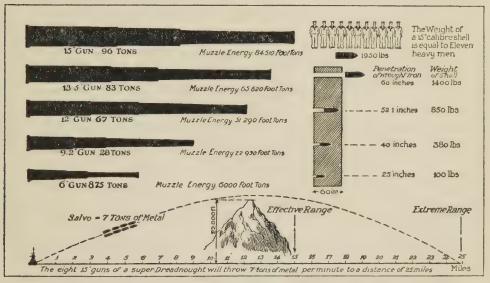


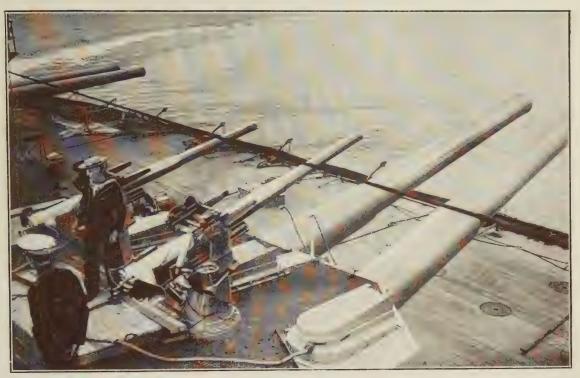
DIAGRAM SHOWING RELATIVE SIZES OF NAVAL GUNS AND PENETRATIVE POWER OF SHELLS.

beth class, with eight 15-in. guns and sixteen quick-firing 6-in. guns, lay to at a distance of over 11 miles and opened fire. Against this fire we could, of course, do nothing. But the battery looked a sight when we broke off the engagement at 6.30. Donnerwetter! You never saw such holes as the shells had made!" This letter fits in very well with one written by an English naval officer, who, in respect of the same engagement, says—"Yesterday was a very long-range affair, but the wonderful part about it was that an enormous battle-ship we have here—the finest battleship in the world—lay off at nine miles and dropped shell after shell, each one weighing nearly a ton, into a fort that she could not see, 12 miles away over the

land. I should have liked to have seen the Turks' faces when the first earthquake fell among them, looking in amazement at each other and saying, 'Now, where in the world did that come from?' We had aeroplanes up spotting for her and signalling by wireless if the shot was a miss, but very few of them were."

Admiral Sir Percy Scott has stated that in firing at a range of 15 miles or more the shot would go to an altitude of 22,500 ft., or more than 6000 ft. higher than the summit of Mont Blanc (see Diagram). "You will realise," says he, "what a variety of atmospheres it would pass through, and how impossible it is for anyone on earth to divine what will be the direction and the force of the winds it will meet with in its ascent and descent. When a mass of iron the size of my body has to pass even five miles through the air, you may imagine what a difference wind behind it, or in front of it, or right or left of it, will make in its final destination. When firing at a range of five miles, which is about what some nations practise now, the shot takes twelve seconds to get to its destination; during that time the ship it is being sent to, if steaming at the rate of about 20 knots, will have changed her position 120 yards. must point our gun in the direction which allows for this. there is the forward movement of your own ship, which will be imparted to the projectile, and must be allowed for; and there are other corrections to be applied."

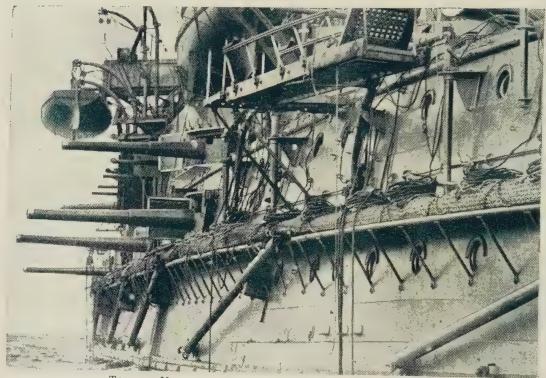
The aiming of a Dreadnought's guns has become a highly scientific matter, and is dealt with by a system of what is called "fire control." In every ship there are fire-control stations where observing officers are placed, who, by means of telephone wires, can communicate with each other and with every turret. They are provided with various delicately adjusted sighting and ranging instruments, by means of which they determine the distance and bearing of the enemy's ship or other target, and the splash or smoke of every projectile fired from their own vessel. This information they signal to the officers in charge of the several guns; and as ranging tables have been calculated for each gun, the elevation to be given is always known, together with the allowances for drift, and all other sources of deviation. In rough weather, moreover, devices are adopted for ensuring the discharge of the gun at the very moment when the ship, in rolling or pitching, assumes a perfectly upright position.



BATTLESHIP CLEARED FOR ACTION.



STEEL NETTING SPREAD AS A PROTECTION FROM SPLINTERS



TORPEDO NETTING COILED ALONG THE SIDE OF A BATTLESHIP.



MIDDIES SITTING ON 13'5 GUNS.

The effect of all these arrangements is that naval gunfire has now become comparable in accuracy with that attained by artillery on land service. "Twenty years ago," says an expert, "target practice was usually carried on by British warships at a range not exceeding 2000 yards. Nowadays the same kind of practice is habitually carried on at a range of from 10,000 to 12,000 yards [say, from 5½ to 7 miles], and it is no exaggeration to say that the average accuracy of aim at this vastly increased range is much higher than that formerly attained at the comparatively puny range of 2000 yards or less. The secret of this amazing development is to be sought in the words 'fire control,' and all that they imply."

ARMOUR AND OTHER MEANS OF PROTECTION

A Dreadnought, however, has not merely to be provided with means of striking her foes; she has also to be protected, so far as is possible, against being struck in return. For this purpose a considerable portion of her sides is covered with steel armour plates varying in thickness from 4 to 12 inches, according to position; while internal protection is given by decks and bulkheads plated with steel $1\frac{3}{4}$ and $2\frac{3}{4}$ inches thick. In addition, there is a supply of steel netting which, when the ship goes into action, can be fixed up as a guard against splinters.

But the enemy's gunfire is not the only danger to be feared. What is even more to be dreaded is the torpedo; and against this weapon defence is very difficult. It cannot be reached by either big guns, quick firers, machine-guns, or small arms; and no other offensive defence is possible. Something may be done in the way of escape by skilful steering and avoidance; but it is not often that the line of bubbles indicating the approach of a torpedo can be seen. There remain only two methods of protection, so far, that is to say, as invention yet goes. One of these consists in providing ships with a multiplicity of internal bulkheads, thereby dividing the interior into watertight compartments. Our Dreadnoughts are composed of some 200 to 300 of these isolated spaces, any two or three of which may be torn open and flooded without vitally endangering the safety of the ship. The partition bulkheads are furnished with doors which remain open in times of safety and can be closed by hydraulic

pressure set in action from the bridge when danger threatens. But their closing interferes materially with intercommunication between the various parts of the ship, and thus adds greatly to the task of commanding its movements and directing its fighting efforts; while, at the best, a torpedoed ship, even if unsunk, has to go home for repair. Partitioning, therefore, is not regarded as a *reply* to the torpedo: it is but a palliative.

The other possible protection is torpedo-netting, or the "crinoline" as it is commonly called. Strong steel nets are suspended from the ends of booms projecting outwards from the sides of the ships. These nets dip down into the water and are supposed to arrest the progress of an enemy torpedo which, if it explode on striking the net, will do so at a distance sufficiently great to preserve the ship from injury. Whether the protection thus rendered possible is or is not a matter of the game being worth the candle is a much-controverted question. On the one hand, it is practicable only when a ship is stationary or is moving at slow speed, whereas the greatest possible rapidity of movement is desirable when torpedoes are about. And, on the other hand, it is found that the nose of a torpedo can be fitted with automatic cutting appliances quite capable of effecting a passage through the stoutest steel netting hitherto adopted for "crinolines." When all is said and done, therefore, the fact remains that the mighty Dreadnoughts—the mastodons of the sea—are less than a match for the puny torpedoes—the microbes.

THE FUNCTION OF DREADNOUGHTS

The thoughtful student of naval affairs may go even a little further than is implied in the preceding sentence. He may ask of what use a Dreadnought is in time of actual war. This is a question that every Admiral and every Naval Ministry throughout the world is now seriously considering. If we confine our attention to battleships protected with the heaviest armour and armed with the biggest guns,—i.e. to the ships that are specially known as "Dreadnoughts,"—and if we exclude the "Dreadnought cruisers," in which power and resistance are sacrificed in some measure to speed, we are bound to confess that, with the one exception of the Queen Elizabeth in the Dardanelles operations, the big ships in question have as yet

accomplished little. At the first blush it may indeed be thought that the work of our Dreadnoughts has been analogous to that of Nelson's line-of-battle ships, and that what he did off Toulon is paralleled by what we do off the Bight of Heligoland. But a little closer scrutiny reveals the difference. Nelson's ships could keep the sea: they were not in need of constant supplies of coal: they were not full of elaborate machinery and intricate mechanism for ever needing attention and repair. And, above all, they could be off an enemy's haven without fearing either mine, torpedo, or submarine. Our Dreadnoughts, on the contrary, have to remain in, or close to, their home ports. They are not free of the seas any more than is the enemy. Their positive fighting value is unquestionable. Where the trouble comes in is that there is no fighting to be done, and that they are not fit for anything else. They cannot even watch the enemy's fleet.

It does not follow that the captain and crew of a Dreadnought have an easy time when their country is at war. They may not go far from port; they may not patrol the seas or the coasts; they may not protect the harbours and river-mouths from raids and bombardments; they may not convoy merchantmen or even protect them against hostile attack; they may not escort the troops, ammunition, and supplies that are sent abroad; their rôle may be entirely passive; and yet it entails a vast amount of labour, skill, and endurance. Few landsmen understand what is meant by proficiency in a sailor. best authorities are agreed that it takes at least seven years to train a man so that he becomes a thorough seaman; and this thoroughness needs to be maintained by perpetual drill and exercise. A competent critic-himself a naval officer of eminence-has said: "In a fighting service, discipline is a chain in which there can be no weak links; all must ring true when tested, from the one that binds the admiral in command of a fleet with his captains to that which unites the petty officer with the seaman, the stoker, and the boy. With the brief exception of such shore leave as is enjoyed by officers and men, the Navy is always on duty, the tension is never relaxed. As soon as a ship is commissioned the process begins of welding the ship's company into one homogeneous whole; the strenuous and unceasing endeavour to make the ship a perfect unit in the fighting line and to render her worthy in the day of battle is the one preoccupation of all on board.

It is not discipline alone, neither is it drill alone, that makes of men complete sailors. . . . The habit of the sea is a thing altogether indefinable, a thing that cannot be set down in words; all the same, it is that habit which has made of the seamen of England what they have been in the past, and what, we are proud to think, they remain

in the present."

It is just this habit of the sea that has to be kept up and even intensified in wartime. The home-tied Dreadnought is ever labouring for the acquisition of efficiency. It moves from port to port; it takes part in fleet evolution; it practises gunnery; it carries out the boat exercises prescribed by the regulations; it endeavours to make record time in coaling and in the shipment of ammunition and provisions; it experiments with every device already known or that its officers can suggest as a protection against mines, torpedoes, submarines, and aircraft; it steams out into fog and storm to test and improve the handiness of its crew; and, both by night and day, week in and week out, the round of duty and instruction is pursued. There is nothing in the army quite comparable with this perfection of system. "Organisation," says the critic already quoted, "on board a man-of-war, of whatever size, is the breath of her life. Every man and every officer has assigned to him a station for every evolution that is performed." There is what is called a Watch Bill dividing the crew into groups and fixing their times and places ("stations") for the ordinary work of the ship, and there is another document called a Quarter Bill for making a corresponding division in action. In these bills are found provisions for noting down the station of every officer and every man for all drills, evolutions, and emergencies. "Thus," says our authority, "in 'officers' stations' we observe headings for watch, division, open list, day and night action, clearing for action, landing party, net exercise, man and arm boats, abandon ship, fire stations, collision stations, out bower or sheet anchor, anchoring station, and coaling ship. In the Quarter Bill are told off the crews for turrets, broadside guns, ammunition supply, torpedo tubes, searchlight crews, control positions, transmitting stations, recording party, action parties, such as fire brigade, the distribution of rifles to companies, the names of supernumeraries, and the composition of the field guns' crews.

"These things that have been enumerated form the main scheme

of organisation; beyond this there is the subdividing of different parties, such, for instance, as the magazine men. So many men are told off for each magazine; these, again, are divided up into men inside the magazine, men in what are known as the handing rooms, and supply parties. There are, besides, the telling off of the boats' crews, the apportionment of small arms, and other subsidiary affairs to which to attend." Here, indeed, is a formidable list of matters that require skilled attention on the part of the officers and routine-familiarity on the part of the men.

THE SAILOR'S LIFE ABOARD

Readiness for action on the part of a battleship means the sacrifice of many things conducive to the comfort of her crew. Take, for example, the following account sent home by an officer in the Mediterranean squadron: "I am stationed," he writes, "at a searchlight during the night, and work from 7.30 p.m. to midnight, and then from 1.30 a.m. to 4 a.m. All the searchlights are trained by midshipmen; by the word 'trained' I mean operated or sweeping. The ship is a perfect sight; all the wood has gone over the side—tables and chairs, pictures, chests of drawers, etc., and anything that is likely to cause fire. I have had to throw all my books overboard, and a lot of old clothes. All the paint-work is being scraped, and there is nothing but the bare iron. Every man in the ship has to scrape a square yard of paint every day, including the officers. All the brass is painted over, and anything that will show up at night is also painted. I sleep in the dynamo fan-casing on the upper deck. I have not taken off my clothes for a month during the night: in fact, I think my pyjamas have gone over the side!" How far the regulations that prescribe such sacrifices represent the triumph of red tape over common sense, we need not here discuss; the point we desire to make being an understanding of what modern naval warfare means in hard fact. Yet Jack himself is always the last to acknowledge that facts are hard for him. At the battle off Heligoland, when the Mainz was sunk, orders were given on H.M.S. Falmouth to lower boats and save life. Volunteers were asked for, and they were anxious to go. Among them was a stoker on the sick-list with a burnt foot. It was as much as he could do

to hobble along. An officer shouted, "That man there cannot go." The stoker replied, "You don't pull an oar with your foot, sir." British heroism is not yet dead. Nor has British gentleness for our four-footed fellow-creatures disappeared. One of the sailors in the same boat with the stoker leaped overboard and rescued a half-stunned dog from the German ship. The animal was adopted as the Falmouth's mascot and became great friends with the crew. He now wears a collar stamped, "Dog of War. Naturalised British subject, H.M.S. Falmouth, 1914."

And yet, as in all cases where Englishmen are called upon to lead strenuous lives, light-heartedness is found predominant on board our Dreadnoughts. "In the accounts of the old blockades," says the Times, "we read how, by means of music and dancing, and even theatrical entertainments, the monotonous nature of the work was counteracted, and the officers of the ships, including Nelson and other great commanders, welcomed these diversions for the prevention of the evils which might be bred by enforced idleness. As Kempenfelt once said, everything that stagnates corrupts." Stagnation is about the last thing one would think of in our battleships of the Grand Fleet. Intense and exacting life is the rule, and during the periods of exception Jack is not a whit the less busy. "We manage," writes a seaman in H.M.S. Tiger, "to get a good deal of quiet fun out of life. We have a marine band on board. To-night we had a pleasant musical evening. Usually we have a rough-and-ready concert, and have a number of very good singers. Our concert usually consists of about a dozen turns. Every free evening there are a number of men dancing. To anyone not used to naval life an evening here would be interesting. Our battery-deck is the playground. Try to imagine a steel compartment about 8 feet high, 18 feet to 20 feet wide. and, roughly, 100 feet long. One end dancers are enjoying themselves to the strains of a melodeon. The remainder of the crew are scattered about, mostly seated on the deck busy with cards. dominoes, and papers. Here and there you will see a fellow up against the side with a writing pad on his knee writing letters. little crowds chatting, and everyone, or, rather, almost everyone, smoking—so many that a stranger, at any rate, on entering, would imagine the place on fire. On the lower decks one or two gramo-



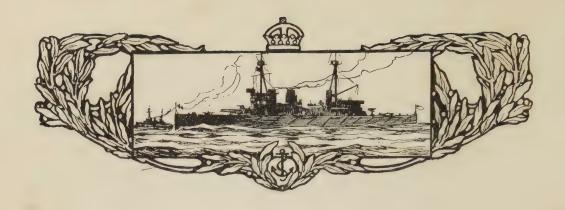
One man has a telephone slung from his head with which to communicate with other parts or the ship, A QUICK-FIRING GUN TEAM READY FOR INSTANT ACTION.



STOKERS FEEDING THE FURNACES ON A WARSHIP.

phones try to outdo each other for noise. So you see we are not dull."

The touch of light here revealed contrasts vividly with the shade that meets us when we turn to the other aspect of the picture, to the contemplation of a Dreadnought as an engine of destruction. The mighty power thus set afloat for use in any part of the seven seas may perhaps be best estimated by comparing it with that of an army on land. The striking force of a single Dreadnought exceeds that of all the artillery and rifle fire combined of 300,000 soldiers; and from this point of view it may be said that the entire fleet mobilised by England is the equivalent of a group of armies numbering more than 15,000,000 combatants. Add this to our Regulars on land, our Territorials, our New Armies, and the contingents furnished by India, Canada, Australia, New Zealand, South Africa, and all the other Britains: the total is worthy of Armageddon itself.



The term "cruiser" is not very illuminating when employed to designate a particular class of vessels in a navy. It is, indeed, a word of no distinction at all. Every vessel right through the entire gamut, from battleship to gunboat, is a "cruiser" of a sort. Nay, more: we speak of the "cruise" of a submarine. But the ways of red tape are mysterious, and not to be understood of the common folk. We must accept the "blessed word, Cruiser," and do our humble best to digest it and convert it into information.

The sense in which cruisers, as a whole, may be distinguished from battleships, as a whole, is in respect of employment, or "function," as perhaps we ought to say if we desire to fall in with the literary fashion of the day. A battleship does not rove. It takes up a station in a line of battle, or off some port or land-position that has to be bombarded; and its motive-power is brought into play mainly for the purposes of mere transport. A cruiser, on the other hand, is a rover par excellence. It reconnoitres; it patrols; it chases; it blockades; it guards the seaways of commerce; it convoys; it darts here, there, and everywhere, in accordance with the needs of the navy to which it belongs, or with the requirements of national sea-power. And in view of the great variety of such needs and requirements we should expect to find a corresponding variety in the construction, armament, equipment, power, speed, and other details of cruisers. This expectation is fulfilled if we consult the British Navy List.

First of all, we find there are a number of vessels denominated

"light cruisers," in addition to a few "scouts" which frequently appear as "light cruisers" in published lists of the ships composing the Navy. We also find a class of "third-class cruisers" indistinguishable, except by name, from the scouts and light cruisers. Next in order we have "second-class cruisers," which are a little more heavily gunned and are somewhat larger than the foregoing; but in other respects they are much the same. Then come the firstclass or "armoured" cruisers, and, finally, the "battle-cruisers," which are often called "Dreadnought cruisers." All of the classes here enumerated are designed from the point of view of mobility, and, broadly speaking, they are interchangeable when it comes to the question of actual employment; but they differ among themselves with regard to size, armour, guns, horse-power, and speed. The degree of variation thus existing may be judged of by the following table, which gives details of the Dreadnought cruiser Tiger as compared with the "protected third-class cruiser" Pelorus.

					TIGER.	Pelorus.
Displacement (tons)					28,000	2,135
Horse-power.			•		100,000	7,000
Armour, belt (inches)					9	•••
deck					. 3	2
" gun-position	(inch	es)			ğ	0'22
13'5-in. guns	` .				9	***
6-in. guns		٠			12	***
4-in. ,						8
3-pounder guns .			-		··· ₁	8
Machine-guns		·		1	7	7
Coal capacity (tons)	•	•			2 000	# sh
Speed (knots) .	•		•		3,000	517
Complement			•	,	28	20
Complement	•	•			980	234

When, therefore, we read of a "cruiser" or of a "cruiser squadron," the phrase conveys no information to our minds respecting the size and power of the ships concerned. It is necessary for us to be told either the technical details or the "type" of each vessel before we can form a correct judgment as to the force in action; though, if we be familiar with the List of the British Navy, it is, of course, sufficient for us to learn merely the names of the individual cruisers.

PRINCIPLES OF CONSTRUCTION

This matter of variation in detail is of great interest as being the practical outcome of the wider question of the construction of warships in general, which by naval constructors and the Admiralty is regarded as involving the consideration and determination of how best to ensure the following "qualities," as they are termed:

- 1. Strength.—A ship has to carry a load. In rough weather she is not uniformly supported by the water in which she floats, and, if not strong enough, will break in two. She has to bear the terrific strain imparted by the thrust blocks in which her propeller shafts work. She has to bear the strains imparted by her guns when they are fired. Even when at anchor her cables are perpetually striving to tear her apart. Stresses of all degrees beset her at every point of her structure. It is necessary, therefore, for her to be built in such a way that her materials and their dimensions shall be such as to support every probable strain and stress she may have to endure.
- 2. Stability.—A warship must float upright in the water and must always return to an upright position after being temporarily inclined by the action of waves, wind, etc. She must also remain stable even after she has sustained a reasonable amount of damage in action or through accident. It is the business of naval architects to provide for such stability when they design the shape of the vessel and the distribution of her hull and load weights.
- 3. Speed.—This is a matter of hull-form, size, and engine-power, and is determined by the particular range of duties for which the ship is designed.
- 4. Handiness.—Warships must be quick in turning and manœuvring generally, especially in these days of mines and torpedoes. Their rudders are therefore large and are actuated by steam or other power; and resort is had to what is termed the "cutting away of 'deadwood'" at the stern of the ship, that is to say, making the after end of the hull much shallower than the midship and bow portions.
- 5. Handiness of Transport Arrangements.—Dispatch in coaling, facilities for coal-trimming and furnacing, and provisions

for speedily transferring ammunition from the magazines to the guns are all of great consequence in naval vessels.

- 6. Accessibility.—The design must be such that every part of the structure can be readily got at for examination, painting, and repair.
- 7. GOOD ARMAMENT.—Guns, torpedo-tubes, ammunition, and torpedoes must be provided for in such quantities and of such kinds as may be suited for the work intended to be done by the vessel.
- 8. Habitability.—The living-spaces of the ship must, to the greatest extent possible, be supplied with air and natural light. In this particular, high freeboard vessels contrast favourably with low-sided ships, since in the former the living-spaces may be well above water and can have lights and ports in the side.
- 9. Length of Vitality.—This means the length of time during which a cruise can be carried on in good fighting condition. It is determined by the quantity of fuel, ammunition, provisions, and stores carried.
- 10. SLOWNESS OF DESTRUCTION.—This depends upon the thickness and distribution of the armour-plating, upon the subdivision of the ship into watertight compartments, upon the duplication of important parts, and upon other analogous devices.
- 11. ECONOMY OF FIRST COST AND MAINTENANCE. This "quality" speaks for itself.

The enumeration here set forth shows the important problems that have to be dealt with by the British naval authorities in order that an efficient fleet may exist; and an equally important and even more complicated set of problems exists when the employment of the fleet is in question, that is to say, when the various ships forming the fleet are assigned to their several duties, which were conveniently classified by the late Sir Nathaniel Barnaby (Chief Constructor of the Navy) in 1877 as follows:

I. DEFENSIVE

- (a) The patrol of the highways of commerce by vessels in the employment of the Government for the destruction or capture of rovers.
 - (b) Clearing the offing of important harbours at home and in the

Colonies of hostile vessels, including breaking the attempted blockade of ports.

(c) Convoying merchant ships.

(d) Protecting harbours, naval stations, and coasts, at home and in the Colonies, against violation.

II. OFFENSIVE

(a) The capture of trading ships belonging to the enemy or liable to capture on his account.

(b) The infliction of injury upon harbours, naval stations, and coast towns, and landing military forces on an enemy's territory.

(c) Disabling or destroying the armed ships of the enemy.

(d) Blockading the principal ports of the enemy to prevent the passage of merchandise inwards or outwards, and to lock up his armed ships.

(e) Transporting troops, stores, and munitions of war, and keep-

ing up communications by means of despatch vessels.

In setting forth the foregoing, the official reporter (in 1907) added — "From the above it can easily be gathered that it is impossible to embody in a single type of vessel all the qualities needed for the fulfilment of the above duties. For example, whilst ships which are intended to take their place in the first line of battle must be armoured—i.e. protected against gun attack by thick vertical armour—this method of protection has been usually sacrificed in the small, swift cruisers and scouts where speed is of the utmost importance, the weight saved by discarding armour being utilised to augment the engine power. Again, coast-defence vessels intended to operate near the shore should have less draft of water than seagoing battle-ships, and do not need provision for the storage of such large coal supplies as are necessary in ships intended to act at considerable distances from a base of supplies.

"Distinctive types of vessels for the performance of special duties have thus been evolved, and there are now in the Royal Navy:

First, second, and third class battleships;

Armoured cruisers;

Protected cruisers;

Scouts;





THE SINKING OF THE NÜRNBERG IN



TTLE OFF THE FALKLAND ISLES.



Torpedo-gunboats;
Torpedo-boat-destroyers and torpedo-boats;
Submarine vessels;
Light draft river gunboats;

and also special vessels, as the torpedo depôt ship *Vulcan*; the Fleet repair ships *Assistance* and *Hecla*; and the distilling vessel *Aquarius* provided with plant for the production of fresh water. Special merchant vessels, too, are fitted so that they may be armed in time

of war for self-protection, defence of commerce, etc.

"It may be mentioned that vessels ranked as second and third class battleships were not built as such, but have passed into these divisions from the first-class with effluxion of time. The battleships and armoured cruisers are provided with thick side armour, whilst the more important ships of the remaining classes are protected against gun attack by a thick armoured deck extending from stem to stern."

We have now said enough to convey a clear idea of what cruisers are, how they are constructed and equipped, and the relations they bear to the other component vessels of the British Navy. The discussion has also shown that the major portion of the work of every fleet must fall to the lot of its cruisers; and this theoretical conclusion has been confirmed by practical experience in the Great War. Our scouts, light cruisers, and third-class cruisers have kept watch and ward over the sea-gates of the waters in which the German Fleet has sheltered itself. Our second-class cruisers have stood sentry off our coasts, and have put in an effective appearance on many trade-routes across the high seas. Our armoured cruisers have patrolled the North Sea, and have taken part in several well-contested engagements. And our battle-cruisers have denied the oceans to our foes by smiting and crushing the enemy's warships whenever the German naval flag has floated defiantly in any part of the world. The battles off Heligoland, the Dogger Bank, the Falkland Islands, and off Jutland will for ever be cited by historians as evidencing the power wielded by British cruisers.

THE ACTION OFF THE FALKLAND ISLANDS

The engagement off the Falkland Isles was remarkable not only for the completeness of the victory achieved by our ships, but, still

more, for the circumstances under which the action was projected and fought. On Sunday, November 1, 1914, two English armoured cruisers, the Good Hope and the Monmouth, accompanied by the protected second-class cruiser Glasgow and an auxiliary cruiser (the armed merchantman Otranto, of the Orient Line), fell in, off Coronel, on the coast of Chile, with a German squadron consisting of two armoured cruisers and three third-class cruisers. An action ensued in which the Good Hope and Monmouth were sunk, while the Glasgow and Otranto managed to escape. The news of this reverse reached the Admiralty on Friday, November 6. It was, of course, immediately discussed, and the conclusion was arrived at that, as the German admiral, Count Von Spee, had been encountered when he was sailing south along the coast of Chile, he must have been on his way to raid the Falkland Islands, a design on his part of which the Admiralty had been informed early in October, and of which they had warned the Governor of the Islands. It thus became clear that Port Stanley, the principal harbour of the Falkland Islands, was the likeliest place for meeting Von Spee once more, and that, as it was 7000 miles away from England, any British force dispatched to do battle must consist of very swift and powerful ships in order to reach the Islands in time and outmatch the German vessels.

Dreadnought cruisers could alone "fill the bill." The Invincible and Inflexible, of 17,250 tons, 41,000 horse-power, and over 28 knots speed, were lying fully coaled and provisioned in a home port. Each carried a main armament of eight 12-in. guns, so mounted as to be capable of simultaneous discharge either to port or to starboard: and they were thus very much more powerful than the German armoured cruisers, the Scharnhorst and the Gneisenau, of 11,600 tons and eight 8.2-in. guns. Orders were given for them to start at once under the command of Vice-Admiral Sir F. C. Doveton Sturdee. K.C.B., and at the same time instructions were sent to the battleship Canopus, the armoured cruisers Carnarvon, Kent, and Cornwall, the protected second-class cruisers Glasgow and Bristol, and the armed liner Macedonia (all of which were in the South Atlantic), to rendezvous at Port Stanley. So well did the several commanding officers discharge their duties, and so good was the condition of the several ships, that when Admiral Sturdee arrived, on December 7, at his destination he found the remainder of his fleet already there.

In the meantime, the German admiral steamed slowly round Cape Horn and made for Port Stanley. He seems to have had no suspicion of the prompt action taken by the British Admiralty, and he took no pains to inform himself as to the presence or absence of an enemy force in the harbour to which he was advancing. Hence he was taken completely by surprise when he arrived off Port Stanley on the morning of Tuesday, December 8, and saw the British Fleet issuing forth in battle array. Everyone knows the result. The Inflexible and Invincible, owing to their superior speed, soon overhauled the Scharnhorst and Gneisenau, and by means of their much heavier guns, aided by long-range firing from the Carnarvon, succeeded in sinking them both. Of the remaining three German ships, the Dresden, which had a long start and was very fast, just managed to get clear away into a mist, and escaped; but the other two, the Leipzig and Nürnberg, were overtaken and destroyed by the Glasgow, the Cornwall, and the Kent. The sinking of the Nürnberg was described as follows in Admiral Sturdee's report to the Admiralty:

"Owing to the excellent and strenuous efforts of the engine-room department, the Kent was able to get within range of the Nürnberg at 5 p.m. At 6.35 p.m. the Nürnberg was on fire forward and ceased firing. The Kent also ceased firing, and closed to 3000 yards; as the colours were still observed to be flying in the Nürnberg, the Kent opened fire again. Fire was finally stopped five minutes later, on the colours being hauled down, and every preparation was made to save life. The Nürnberg sank at 7.27 p.m., and, as she sank, a group of men were waving a German ensign attached to a staff. Twelve men were rescued, but only seven survived."

The reference to the engine-room department of the Kent was occasioned by the very unusual incident that had occurred on board the vessel. She was very short of fuel, and had begun to lag behind in the chase. Her captain was told of the reason why her speed was falling off. "Very well," he replied; "then have a go at the boats." No sooner said than done: the boats were hacked to pieces: the pieces were covered with oil and fed into the furnaces. Then came the turn of the cabin doors, the wooden steps, the officers' chests of drawers, and the middies' tables. The

Kent, whose official speed was 21.7 knots, and that had never made more than 20 on her station off the coast of Brazil, now broke all of her own records by making 24 knots, and so crept up to the enemy. She had a very narrow escape, however. A shell from the Nürnberg ignited two cordite charges in the casemate of one of her (the Kent's) guns; and the flame shot down the ammunition hoist. Sergeant Charles Mayes instantly picked up the burning charges, threw them on the outer gun-deck, and turned the waterhose on the hoist, flooding the compartment below and preventing the fire from extending to the magazine, an explosion in which would, of course, have destroyed the ship. For this exhibition of prompt courage and good judgment the sergeant afterwards

received the Conspicuous Gallantry Medal.

The whole Falkland Islands affair, from its initiation to its close, was an excellent illustration of the part played by cruisers in actual warfare. Mobility was to the fore, and proved its practical value, especially when coupled with readiness of preparation. The picture is worth studying. Here was a sudden emergency arising more than 7000 miles away. A British defeat had to be avenged; a British colony had to be saved; the trade-routes of the Empire had to be freed from a menace that had already been attended by disaster and was growing more dangerous. The wand of the Admiralty was waved. Instantly there sprang forth two monsters of the deep, armed to the teeth, and fully found in everything necessary for long voyaging and hard fighting; and from the ends of the earth other monsters, less in size, perhaps, but not less grim and fierce, sped swiftly to join them in an onslaught on the Two short months elapsed, and the dragons of the seas were back again in their lairs, having flown some 14,000 miles, and having, with their fiery breath and a stroke or two of their sharp claws, destroyed the foe that was threatening their land. will be searched in vain for the record of quite so surprising a triumph of naval science and organisation.

CRUISER ACTIONS IN THE NORTH SEA

The battles in the North Sea were also examples of British cruisers in action; but the aspect of the case was different. There

was not any far-flung effort in response to a sudden call for aid. It was a question, rather, of fitness for the day's work, of skill in adapting each ship in its own way to the requirements of the moment, and of strenuous ability in the discharge of the duties devolving on the officers and men engaged. Both fights were cruiser actions, and were entered into as part of the normal work involved in guarding the North Sea. This work had two phases. First, it was necessary to watch closely the assemblage and movements of the enemy's ships in his home waters, that is to say, in the Bight of Heligoland and thereabouts; and such watching was to be supplemented by feints of attack, and even by real attacks, whenever opportunity should serve. And, secondly, the broad waters of the North Sea had to be continuously and vigilantly patrolled for the purpose of intercepting and defeating any forces of the enemy that might succeed, through fog or darkness, in evading the watch-line. Light and speedy cruisers were required as observers and reporters; armoured and heavily-gunned cruisers were needed for the patrolling squadrons. Both classes of ships, however, had to be alike in their capacity of endurance. They had to keep the sea under all conditions of weather, and had to be ready for action at all hours of the day or night; and this was to be done continuously for periods limited only by the necessity of re-coaling and re-provisioning from time to time. These requirements do not appear very arduous when merely spoken of or written about; but in actual practice they have called for the noblest kind of heroism, namely, the heroism that can do, dare, and suffer in silence and obscurity.

The Battle of the Bight was well planned and well carried out. A few submarines and torpedo-boats were, on the morning of August 28, 1914, pushed forward towards Heligoland as a lure to entice the enemy to sally forth. The device succeeded, and the small vessels withdrew seawards in the direction of various light cruisers which, with flanking flotillas of destroyers, were to await the approach of such vessels as the Germans might employ to chase the decoy craft. Behind the light cruisers was a well-dispersed screen of second-class cruisers for the purpose of destroying any enemy ships that might seek to escape from the mêlêe; and behind them again were four battle-cruisers—the whole force being disposed at such distant

intervals as to be out of the enemy's sight or appreciation. plan worked well. The German destroyers at first saw nothing in front of them save the retreating torpedo-boats and submarines; and as there thus seemed to be no question of any British fleet being near, the chasing force was strengthened by three light cruisers —the Mainz, the Köln, and the Ariadne. When, however, some 30 or 40 miles from Heligoland had been covered, first one and then another British warship began to appear through the morning mist, succeeded by yet others, coming from all sides. A stubborn fight ensued, in which the English light cruiser, Arethusa, greatly distinguished herself; and it was continued until Admiral Sir David Beatty, in the battle-cruiser Lion, arrived on the scene with his 13.5-in. guns firing shells weighing 1250 lb. and capable of making good practice at ranges extending to seven miles and more. German destroyers and cruisers forthwith steamed for home; but the Mainz and Köln had already been seriously damaged, and were now sunk, together with the leading boat of the enemy's destroyer flotilla, the V187, a vessel of 650 tons and 32½ knots, armed with two 20-pounders and four machine-guns. Altogether it was a brisk and creditable affair, as may be further understood by the following account written by one of the British officers who took part in it:

"The Mainz was immensely gallant. The last I saw of her, absolutely wrecked alow and aloft, her whole midships a fuming inferno. She had one gun forward and one aft, still spitting forth fury and defiance 'like a wild cat mad with wounds.' Our own four-funnelled friend [the Köln] recommenced at this juncture with a couple of salvoes, but rather half-heartedly; and we really did not care a pin, for there, straight ahead of us, in lordly procession. like elephants walking through a pack of pi-dogs, came the Lion, Queen Mary, Invincible, and New Zealand, our battle-cruisers. Great and grim, and uncouth as some antediluvian monsters, how solid they looked, how utterly earthquaking! We pointed out our latest aggressor to them, whom they could not see from where they were, and they passed down the field of battle with the little destroyers on their left and the destroyed on their right, and we went west while they went east, and turned north between poor four funnels and her home, and just a little later we heard the thunder of their

guns for a space, then all silence, and we knew. Then wireless— Lion to all ships and destroyer—'Retire.'

"That was all. Remains only little details, only one of which I will tell you. The most romantic, dramatic, and piquant episode that modern war can ever show. The Defender [an 'ocean-going destroyer' of 750 tons, 13,500 horse-power, 28.3 knots, and armed with two 4-in. guns and two 12-pounders, in addition to two torpedotubes] having sunk an enemy, lowered a whaler to pick up her swimming survivors; before the whaler got back, an enemy's cruiser came up and chased the Defender, and thus she abandoned her whaler. Imagine their feelings: alone in an open boat without food, 25 miles from the nearest land, and that land the enemy's fortress, with nothing but fog and foes around them. Suddenly, a swirl alongside, and up, if you please, pops His Britannic Majesty's submarine, E4, opens his conning-tower, takes them all on board, shuts up again, dives, and brings them home 250 miles! Is not that magnificent? No novel would dare face the critics with an episode like this in it, except, perhaps, a story by Jules Verne; and all true."

The battle off the Dogger Bank was simpler, but was equally illustrative of cruiser-utility and cruiser-power. The North Sea was divided into areas, each of which was patrolled by squadrons of "battle" and "armoured" cruisers, preceded, a long way ahead, by flotillas of light cruisers and destroyers whose business it was to skirmish with any enemy they might encounter and hold him engaged until the heavier vessels of the patrol could come up. Sunday morning, January 24, 1915, Admiral Sir David Beatty in the Lion, together with four other battle-cruisers, the Tiger, Princess Royal, New Zealand, and Indomitable, was patrolling in the neighbourhood of the Dogger Bank, his advanced reconnoitring flotilla consisting of the protected second-class cruisers Southampton, Nottingham, Birmingham, and Lowestoft, the light cruisers Arethusa, Aurora, and Undaunted, and a number of destroyers. At 7.25 a.m. the vanguard reported by wireless that they were in touch with a German squadron consisting of three battle-cruisers, the Moltke, Seydlitz, and Derflinger, the armoured cruiser Blücher, six light cruisers, and some destroyers, and that these ships, having detected the presence of the British Dreadnought cruisers, had turned about and were making for the Heligoland waters. Admiral Beatty at

once ordered chase to be given, and led his squadron in line ahead at the greatest speed that could be made possible by the most strenuous effort of the engineer staffs. His ships thus reached the amazing figure (for such huge vessels) of 28.5 knots, whereas three of the German cruisers made only 27 knots, and one, the *Blücher*, fell astern at the rate of 25 knots.

A stern chase is proverbially a long chase, but in an hour and a half the Lion had forged ahead to within extreme gun-range (from 18,000 to 20,000 yards, i.e. 10 to about $11\frac{1}{2}$ miles) of the Blücher. At 9.9 the Lion hit the Blücher for the first time; at 9.20 the Tiger followed suit; and very shortly afterwards the doomed German ship came under fire from the Princess Royal and New Zealand. The enemy's twelve 8·2-in., eight 5·9-in., and sixteen 4-in. guns were, of course, completely overwhelmed by the twenty-four 13·5-in., sixteen 12-in., twelve 6-in., and sixty-four 4-in. guns of the British ships; but at three minutes past eleven the Lion was put out of action by a shell from one of the German ships, and had to be taken in tow by the Indomitable, while the Tiger was also struck and considerably damaged. Still, the hour of fate had come for the Blücher, and she sank before noon. The other German vessels escaped.

THE EPISODE OF THE BLÜCHER

Very few reports have been received from enemy sources descriptive of the effects produced by the fire of British warships; and, fortunately for ourselves, we have not had to study any similar effects on our own vessels. The following particulars, therefore, given by some of the survivors from on board the *Blücher* (some 250 of whose crew were saved by boats from the English vessels), are of peculiar interest:

"The British ships were away on the horizon, some 15 or 16 kilometres distant, when they started to fire. Shots came slowly at first. They fell ahead and over, raising vast columns of water; now and then they would fall astern and short. They were ranging. Those deadly water-spouts crept nearer and nearer. The men on deck watched them with a strange fascination. Soon one pitched close to the ship, and a vast watery pillow, a hundred metres high, fell lashing on the deck. The range had been found. Now the





shells came thick and fast, with a horrible droning hum. At once they did terrible execution. The electric plant was soon destroyed, and the ship plunged into a darkness that could be felt. You could not see your hand before your nose. Down below decks there were horror and confusion, mingled with gasping shouts and moans as the shells plunged through the decks. It was only later, when the range shortened, that their line of flight flattened, and they tore holes in the ship's side and raked her decks. At first they came dropping from the sky. They bored their way even to the stokehold. The coal in the bunkers was set on fire; and as the bunkers were half empty, the fire burned fiercely. In the engine-room a shell licked up the oil and sprayed it around in flames of blue and green, scarring its victims and blazing where it fell. Men huddled together in dark compartments, but the shells sought them out, and there Death had a rich harvest. The terrific air-pressure resulting from explosion in a confined space left a deep impression on the minds of the men of the Blücher. The air, it would seem, roars through every opening and tears its way through every weak spot. All loose or insecure fittings are transformed into moving instruments of destruction. Open doors bang to-and jamb-and closed iron doors bend outward like tinplates, and through it all the bodies of men are whirled about like dead leaves in a winter blast, to be battered to death against the iron walls.

"There were shuddering horrors, intensified by the darkness or semi-gloom. As one poor wretch was passing through a trapdoor a shell burst near him. He was exactly half-way through. The trap-door closed with a terrific snap. In one of the enginerooms—it was the room where the high-velocity engines for ventilation and forced-draughts were at work—men were picked up by that terrible rush of air like the whirl-drift at a street corner, and were tossed to a horrible death amidst the machinery.

"If it was appalling below deck, it was more than appalling above. The *Blücher* was under the fire of so many ships. Even the little destroyers peppered her. 'It was one continuous explosion,' said a gunner. The ship heeled over as the broadsides struck her, and then righted herself, rocking like a cradle. Gun crews were so destroyed that stokers had to be requisitioned to carry ammunition. Men lay flat for safety. The decks presented a tangled mass of

scrap-iron. In one casemate, the only one undestroyed, two men continued to serve their gun. They fired it as the ship listed, adapting the elevation to the new situation. Yet through it all some never despaired of their lives. Others from the beginning gave themselves up as lost. The disaster came upon them so suddenly that few had time to anticipate their plight or to realise it when it came.

"The Blücher had run her course. She was lagging lame, and, with the steering-gear gone, was beginning slowly to circle. It was seen that she was doomed. The bell that rang the men to church parade each Sunday was tolled: those who were able assembled on deck, helping as well as they could their wounded comrades. Some had to creep out through shot-holes. They gathered in groups on deck awaiting the end. Cheers were given for the Blücher, and three more for the Kaiser. The 'Wacht am Rhein' was sung, and permission given to leave the ship. The British ships were now silent, but their torpedoes had done their deadly work. A cruiser and destroyers were at hand to rescue the survivors. The wounded Blücher settled down, turned wearily over, and disappeared in a swirl of water."



THE development of inventions is very seldom a rapid process; and this tardiness is particularly marked in naval and military matters. Even the fundamental, and, as we now think, obvious improvement, which consisted in substituting steam-power for sails, was discussed for more than a generation before being "In 1841," says a naval writer of eminence, "the Adadopted. miralty set their faces like a flint against steam vessels, which, they felt convinced, were useless as fighting machines; and even when they made some slight concessions and introduced a few ships which utilised the new method of propulsion, they were savagely attacked by no less important a person than our old friend Punch, who condemned their idiotic folly in no measured terms. They were told that anything which came out of a 'foundry' was predestined to 'founder,' and that this was all that was likely to happen to their new-fangled 'war steamers.' Punch, however, was preaching to the already converted, and thirteen years later, when the Crimean War broke out, Britain's Fleet was, to all intents and purposes, still mainly composed of sailing ships."

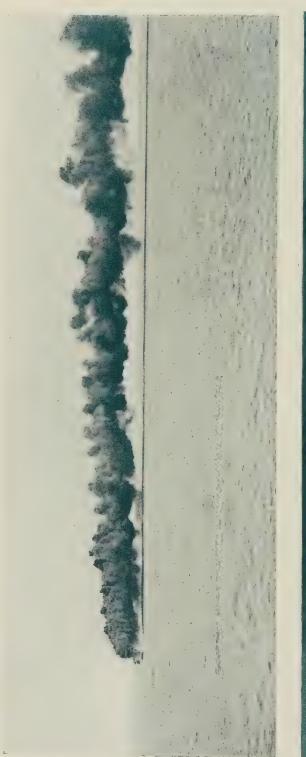
But when, in 1865, the automobile torpedo became an accomplished fact, it received more than ordinary attention. The writer whom we have just quoted may be quite correct in saying that "in the widest acceptation of the term there is no class of men so essentially conservative as the seamen"; but even a sailor takes heed of the menace conveyed by a falling barometer. The Whitehead torpedo was instantly recognised as a deadly peril to be guarded

against. And, from the other point of view, it was recognised as a deadly weapon, the most efficient handling of which was a matter demanding earnest and prompt consideration. Norwegian Government first showed how the new arm could be employed to practical advantage. In 1873 there was completed for Norway, in Thornycroft's shipbuilding yard, at Chiswick, a pioneer craft that took the naval world by surprise. It was only 57 feet long, by $7\frac{1}{2}$ feet beam, and had but $7\frac{1}{2}$ tons of displacement. Yet it was fitted with engines that gave it the then remarkable speed of 15 knots; and, dread omen of all, it carried a torpedo-tube from which a Whitehead torpedo could be launched. The vessel lay low in the water, and, having regard to its small size and exceptional swiftness, was little likely to be hit by the naval gunfire of those days. "The great navies are doomed," cried the press and the public in all countries, and a demand for "torpedo-boats" sprang up everywhere. These new vessels were built by the hundred, and were made larger and larger as the requirements of the case became better understood. Naval manœuvres demonstrated that in order to keep the sea, boats must be at least 100 feet in length; and in the period 1885-1890 the Admiralty specifications for "first-class torpedo-boats" called for a length of 130 feet, a beam of $13\frac{1}{2}$ feet, a draught of water of $5\frac{1}{2}$ feet, engines of 1110 horse-power, and a speed of 23 knots. When the Great War began, the British Navy had upwards of 100 torpedo-boats varying from 60 to 308 tons displacement, with from 600 to 4000 horse-power, having speeds of from 18 to 27 knots, armed with from 3 to 5 torpedotubes and a few (in most cases 2) quick-firing 3-pounder guns (the latest boats have 12-pounders or 16-pounders). The most recent types have turbine-engines, and use oil as fuel. raise a full head of steam in half an hour, and in all except the roughest of weathers can maintain a speed at sea of 27 knots.

The only defence against attack by torpedo-boats was gunfire. Warships were not quick enough or handy enough to escape by running or manœuvring. Protective netting could not be used when in quick movement, and, at the best, could not keep out two torpedoes fired in succession. It became evident, therefore, that a thief must be set to catch a thief. Torpedo-boats were necessarily built in a very light and slender fashion, and could not be armoured



A SCOUTING DESTROYER AS SEEN FROM A SEAPLANE.





The lower picture shows how a destroyer, with its powerful search-light, reveals the presence of another vessel; in the upper picture a destroyer is doing its best to obscure itself from view by means of a dense cloud of smoke from its own funnels, HIDE AND SEEK.

or heavily armed. If, then, bigger and faster craft of the same general type, but carrying fairly powerful guns, could be constructed, there would be a hope and, indeed, a practical certainty, of clearing the seas of the dreaded little wasps. A first attempt in this direction was made by the construction of what were called torpedogunboats (T.G.B.'s) or "catchers"—an illustrative example of which is the still-existent *Hussar*, completed in 1895, having a displacement of 1070 tons, engines of 3500 horse-power, a speed of 19 knots, and armed with one 4·7-in. gun (with a 2-in. shield), two 6-pounders, and one machine-gun. These were satisfactory in their way, but their way did not go quite far enough. They were soon displaced by a speedier type of vessel, the torpedo-boat-destroyers (T.B.D.'s), and these latter, in their turn, gave rise to a still more advanced class, the "ocean-going destroyers" (O.G.D.'s), which, for all practical purposes, may be regarded as light cruisers.

Taking, then, the torpedo navy as a whole, it consists of—(1) torpedo-boats; (2) torpedo-gunboats; (3) torpedo-boat-destroyers; and (4) ocean-going destroyers. In all of these the torpedo is the main weapon, and all are characterised by great speed, great lightness of construction, comparatively small size, shallow draught, and an almost complete absence of protective plating; and, as is almost always the case in such matters, the tendency of construction has been to whittle down the differences between the several classes. This may be seen by the following table, which gives the details of the latest typical examples in the British Navy List at the beginning of the war:

		No. 24 Torpedo-Boat.	Hussar. T.G.B.	Ness. T.B.D.	Landrail. O.G.D.
4-in. guns 12-pounders 6-pounders	• • •	 1908 177 18 292 4,000 26 3 2 2 	1895 1,070 3,500 19 5 1 2 1	1905 222 23½ 600 7,500 25½ 4 72	1914 260 27½ 965 24,500 29 2 3

It will, of course, be borne in mind that submarines are armed mainly with torpedoes, and that these weapons are also carried by battleships and cruisers; but we do not include these categories when we speak of the "torpedo navy," a phrase which is properly restricted to the surface-going fleet built for the accommodation of the torpedo as a primary means of offence.

The actual practice of warfare is generally found to teach lessons that differ very much from the views held in times of peace. has been the case in the present war with regard to the torpedo navy. Torpedo-boats and destroyers were built with two principal objects in view. First, they were expected to launch their torpedoes against the enemy's battleships and cruisers; and, secondly, they were to hunt down and destroy the enemy's torpedo craft. Yet experience has shown that neither of these purposes has been accomplished, and that the true rôle of the torpedo navy is to relieve the light cruisers from the bulk of the patrolling and vedette work necessary in order to maintain the command of the seas. Fighting has turned out to be the rarest of exceptions rather than the rule; but it does not follow that the crews concerned are less tried than their comrades of the big warships. They are, on the contrary, very much more tried. Their vessels are small and wanting in most features that constitute habitable accommodation; and, as has been well said, "let it not be forgotten that high speed is the note of the torpedo service; that weather is no bar to its activities; that to be washed down fore and aft as the boats crash into a head sea, or to ship it green first on one side and then on the other, is the regular routine of these small craft when they run in front of the wind in bad weather." The following account is given by the lieutenant-commander in charge of a destroyer sent out on a patrol from Harwich in December 1914. A fierce gale came on from the north-west and the temperature fell to so low a point that the water froze as it broke aboard. "Then," says the officer, "we all thought that we were done. There was such a frightful sea on, that I had to lash myself to the bridge rails and pray that they wouldn't be washed away. It was on the beam, and we fell off the crest of one sea into the trough of the next sideways like a bench falling off a wall. We couldn't put her head on to it, or we might have gone ashore, and we couldn't see anything for the

spindrift that was flaving us alive. No one could move about the decks, and we knew if there was the slightest failure in the engineroom that we were bound to go to the bottom at once, as the sea would have rolled her clean over. On the bridge we were wet to the skin inside our oilskins, while outside our coats and overalls were frozen into sheets of ice. One lost all sensation, the only thing that remained was the consciousness that it couldn't be worse, and that we were bound to stick it out. At the end of twenty-four hours of this purgatory, the flotilla put into Grimsby, where we had to beat the ice away from the anchor before it could be let go. And then a change came. I heard a voice behind me that said, 'I think you could do with this rather conveniently.' I turned round and saw my engineer officer, and in his hand he had a boiling hot glass of whisky and water; good man, wasn't he? Then someone unlashed me, and I went below to thaw out; and I ain't at all sure that that wasn't the most painful process of the lot."

THE WORK OF DESTROYERS IN THE WAR

But why should patrolling be required? This question is not an unreasonable one when we reflect that the command of the seas fell to the English Fleet in quite the early days of the war, and that the German Fleet remained safely locked up in its own home waters. The facts of the case were, indeed, as here stated, and it may be said, further, that Admiral Jellicoe's disposition of an outlying cordon of light craft acting as observers, scouts, and reporters, backed up by squadrons of cruisers and battleships in the background, was sufficient to prevent any sortie by the enemy. This way of looking at the case, however, does not take any account of submarines; and, as the war has shown, the submarine menace was the only danger of a naval character that demanded attention on the coasts of the United Kingdom. Hence it came about that patrolling was found, after all, to be necessary, and that the torpedo navy discovered its practical vocation, in which was furthermore comprised the look-out for enemy mine-layers and the escorting of our own mine-sweepers. To be everlastingly scanning the seas for the emergence of a periscope or the dull patch that speaks of a mine near the surface, and to be for ever overhauling and questioning all vessels that may be

even remotely possible of acting as mine-layers or supply-ships for the enemy's submarines—such is the whole duty of man as known to the crews of England's patrol craft.

Occasionally, however, the torpedo navy gets the chance of still more "active" service. An instance of this is to be found in a letter from a seaman on board the armoured cruiser *Bacchante*, who writes: "I only wish the whole German Fleet would come out. Their firing is rotten, whilst our men behind the guns are perfect and get a hit every time. The bounders won't come out. That was the reason our ships had to try and drive them out. You see the place is all mined, and if a ship runs into one of these mines it means destruction.

"The commander of the Liberty (an ocean-going destroyer of 965 tons, built in 1913, having engines of 24,500 horse-power, a speed of 29 knots, and an armament of three 4-in. guns with two torpedo-tubes) asked his ship's company if they would volunteer to go up to Kiel harbour with him, and every man said 'Yes,' although it looked like certain death. Up they went and got under the forts of Heligoland, and let rip at the German cruisers in the harbour. One of the wounded sailors of the Liberty told me that the shells fired at them were enough to sink a fleet. He said his ship had only one torpedo and one round of ammunition left when they turned round to come out; and just then a shrapnel shell struck the Liberty's mast, killing the gallant commander and three others. The coxswain, although wounded, brought the ship safely to our Fleet that was waiting outside."

On two other occasions the British destroyers distinguished themselves in actual battle. The first of these was during the engagement off the Bight of Heligoland, when a powerful force of German cruisers and destroyers was attacked by our light craft. Undeterred by the fact that a single shot from the enemy's big guns meant destruction, our destroyers dashed forward to cut off the retreat of the corresponding German vessels, and achieved what was, under the circumstances, a very remarkable success. The 31-lb. shells from the British 4-in. guns were more than a match for the German 20-pounders, and were heavy enough to rip open the thin sides of the enemy destroyers, some eight or ten of which vessels were seriously damaged, while one was virtually torn to pieces and





A BRITISH DESTROYER RAMM



RMAN SUBMARINE.



TORPEDO-BOATS AND DESTROYERS

sank with all hands. On the British side not a single vessel was lost, and the damages sustained were very light.

The other battle was that off the Dogger Bank. German armoured cruisers in line ahead were being chased by a line of British Dreadnought cruisers, whose superior speed and heavier guns threatened defeat. A flotilla of destroyers accompanied the enemy ships; and, as a desperate throw for safety, the German admiral ordered these frail craft to turn and deliver an attack on the British cruisers in the hope that before the fire from the latter could wreck all the destroyers, a torpedo or two might possibly dispose of one or more of the great ships. Our own destroyers had previously withdrawn from the front to the left of our line to prevent their smoke from interfering with the observations of our fire-control officers; but when the enemy destroyers were seen turning suddenly to starboard, the commander, Captain the Hon. N. Meade, of the English flotilla determined to ward off the attack. His foremost vessel, the Meteor, an ocean-going destroyer, outdistanced her comrades and plunged undauntedly into the thick of the fight.

"All through the critical period of the remaining part of the action," says a naval historian, "the position of the little Meteor was terrifying. She was clean in the line of fire, shells whistling over and all around her, with now and again an enemy's broadside aimed directly at her. Try to imagine a frail little vessel steaming thirty-five knots, with four battle-cruisers on either side belching forth flame and smoke continually, and the screech of the projectiles flying overhead seeming to tear the air into ribbons. Twelve and eleven inch shells dropping perilously near sent columns of water 100 feet above the sea, just a few yards away from her deck, and the descending spray drenched every man. All around was the awful crashing noise of the great guns, the yellow explosions, the blue flashes, as the shells struck the armour-plate, with massive tongues of fire shooting up, and dense clouds of black or yellow smoke, which obliterated a whole ship from view when the shells burst upon her.

"The terrible grandeur of the scene made the men on the Meteor forget their personal danger. For sublimely spectacular interest their position was worth the peril they ran. They were hit twice without suffering any material damage, though most of the crew continually missed death by inches. It seemed as though they

TORPEDO-BOATS AND DESTROYERS

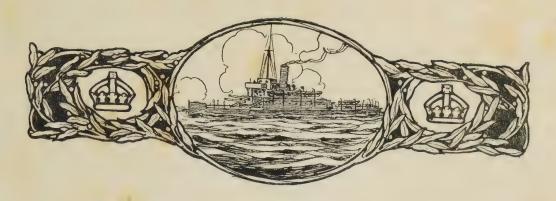
possessed a charmed life until they tried to torpedo the Blücher. She had at last fallen out of the line, a raging furnace amidships, and the German admiral left her to her fate. She had been battered by the 13.5-in. guns of our three leading ships. Then the New Zealand turned her 12-in. guns upon her; and lastly the heroic stokers of the Indomitable brought up their vessel in time to do the final killing.

"This was about noon. To hasten the job the little Meteor circled round the doomed ship that was settling down, though still on an even keel. But even then she was not dead. For, firing her last round, she sent an 8.2-in. shell into the Meteor, which killed four men and wounded another. What next happened is not clear. On the one hand the Meteor, two minutes after the shell struck her, discharged her torpedo. On the other hand the Arethusa (a light cruiser) had also approached the stricken enemy ship, with the same idea of finishing her off, and of releasing the Indomitable for more important work. The Arethusa likewise discharged a torpedo. As at this time the poor old Blücher was almost stationary, it is possible that both torpedoes got home, for the crew of the Arethusa admit that the doomed ship had a terrible list before they fired their first torpedo. The Arethusa used her second torpedo quite close, steaming up within 200 yards of her prey before she delivered her blow.

"The German crew was game to the last. They lined up to the taffrail, standing rigidly to attention, and in this attitude they would have met their death if a British sailor had not warned them. But one of the officers of the *Arethusa* took up a megaphone and shouted to them to jump if they wanted to save their lives. They understood him, and after gallantly waving their caps, and cheering as their ship went down, they all took headers into the water.

"In the meantime the last torpedo got home. The explosion was appalling, and the *Blücher* slowly turned over on her port side, showing her starboard side. Then for some minutes she floated bottom upwards, and at last sank slowly, leaving the survivors of her crew struggling in the water, and being saved one by one by boats from the British ships."

Future generations will have much that is glorious to relate of the torpedo navy that helped to rule the seas during the Great War.



MONITORS

In the course of the American Civil War there was a time when the fortunes of the North seemed to be at a very low ebb. Their navy, composed, in those days, of wooden ships, had blockaded the Southern coast and harbours with great success when, suddenly, an altogether novel adversary appeared. It was indeed a wooden ship, but the Confederates had covered it with iron rails from one of their railways; and when it attacked one of the Federal warships the round cannon balls from the smooth-bore guns of the latter rebounded harmlessly from the protected sides of the Merrimac, as the new vessel was named. The unarmoured ship was speedily sunk "with ease and affluence," and when the news was telegraphed far and wide, dismay and elation were unrestrained according as the recipients sympathised with North or South. It was recognised that this little, roughly-constructed, hastily-improvised craft was more than a match for the whole Northern navy.

And now a singular thing happened—so startling in itself and so astounding in its coincidence that if it were not one of the gravest facts in all history we should be tempted to regard its mention as a wild extravagance of fantastic romance.

There was a Swedish engineer, John Ericsson, living in New York, and known as a man of exceptional ability, wide attainments, and inventive originality. He had long studied the problems of naval attack and defence with especial reference to gunfire; and when the Civil War broke out he offered to build for the Federal Government a vessel that should be capable of steaming up the James River and attacking Richmond, the Confederate capital, in spite of all the batteries the enemy could establish along the banks of the stream.

MONITORS

His offer was accepted, and he built the proposed craft—a shallowdraught boat with a single flat deck on which was placed a low circular iron tower containing a heavy gun and room for a small crew. When launched, it was jeered at by sailors, soldiers, and public alike. Ericsson's "cheese-box on a raft" became a byword. Nothing daunted by ridicule, the inventor persuaded the American naval authorities to arm, equip, and man the queer craft and dispatch it to the James. It arrived in the Hampton Roads at the lower end of the Chesapeake Bay on the morning after the victory achieved by the Merrimac, and found that vessel proudly preparing to destroy the remainder of the Northern fleet. There was no hesitation on the part of the Monitor, as Ericsson's creation was named. She ran into close quarters, and opened fire. Her gun was heavier than any previously mounted on a ship, and the mail-armour of the Merrimac soon fell to pieces under the terrific hammering it received; while the Southern projectiles inflicted no damage on the turret of the Monitor. In less than an hour the Merrimac was driven back. almost sinking, into the harbour from which she had emerged.

The foregoing account will explain the origin of the name "monitor," applied in general to every warship characterised by light draught, low freeboard, and a flush deck, on which is erected an armoured turret or cupola serving as a casemate for a gun or guns. After Ericsson's success many of these vessels were built for the American Navy; but they were found lacking in seaworthiness (the original *Monitor* was lost in a storm off Cape Hatteras), and were ultimately laid up and allowed to rust away at their moorings. The British Admiralty were not more fortunate. They attempted to produce a sea-going monitor, the *Captain*. She turned turtle and foundered in a gale in the Bay of Biscay. Since then it has been recognised that monitors, though excellent craft for river patrols and fighting—as, for example, on the Danube and Paraguay—have not any place in sea-going fleets.

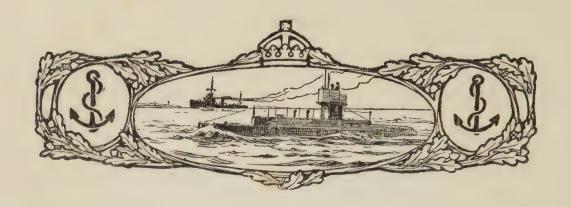
THE WORK OF MONITORS IN THE WAR

At the beginning of the Great War it was found that English shipbuilders were constructing three monitors for South America. These were at once commandeered by the Admiralty on, it is to be

MONITORS

presumed, the principle that "every little helps," even though there did not appear to exist any definite outlook to show they were capable of practical utilisation. Subsequently, however, an occasion arose for testing their capabilities in action. They were made part of the flotilla organised as part of the Dover Patrol for the purpose—as stated in the Report of the officer in command, the gallant Admiral Hood, who met his death eighteen months later in the battle off the coast of Jutland-of preventing the movement of large bodies of German troops from Ostend to Nieuport, and of supporting the left flank of the Belgian Army. The operations undertaken in pursuance of this purpose lasted from 17th October to 9th November 1914. Fortunately the sea remained comparatively smooth, and the weather reasonably fine, so that the monitors, with their light draught, were able to steam close in to shore; and they appear to have done most of the work that was effected. This. however, did not amount to very much, and was summed up by Admiral Hood as follows: "The presence of the ships on the coast soon caused alterations in the enemy's plans, less and less of their troops were seen, while more and more heavy guns were gradually mounted among the sand-dunes that fringe the coast. . . . It gradually became apparent that the rush of the enemy along the coast had been checked, that the operations were developing into a trench warfare, and that the work of the flotilla had, for the moment, ceased." The amount of damage sustained by our ships was not very serious, "the most important being the disablement of the 6-in. turret and several shots on the waterline of the Mersey"—this vessel being one of the three monitors. In addition to this material injury, "On 18th October machine-guns from the Severn [another of the monitors] were landed at Nieuport to assist in the defence, and Lieutenant E. S. Wise fell, gallantly leading his men."

In one direction or another, therefore, British sailors have known how to make some good use of even the most unpromising appliances. 'Tis a way they have in the Navy.

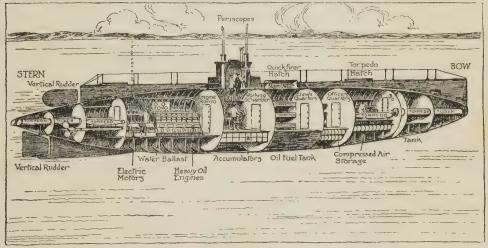


To the general public the activity of the submarine has been one of the outstanding features of the war. To the Navy, who knew all about this type of vessel, what it could do and what its limitations were, recent events have occasioned little surprise. Experts had foreseen all—or nearly all—that would happen in the event of a European war. While the uninitiated looked upon the submarine as something interesting and romantic, a Jules Verne tale come true, those responsible for our naval policy knew that it was a deadly engine of destruction, capable of sending a powerful warship to the bottom of the sea. What they probably did not guess was that it would be used against unarmed passenger ships, carrying women and children and non-combatants.

The invention of the submarine was the direct outcome of the invention of the torpedo. The idea of a boat which could descend and remain under water is, of course, fairly old; but it was not until after the appearance of the torpedo that it began to be regarded as a thing of practical use and urgency. To fire a torpedo with a good chance of hitting the mark, it is necessary to get close up to the object aimed at. The ordinary surface torpedo-boat could only do this on a dark night, when by seizing a favourable opportunity it might creep up to its adversary unobserved; in the daytime, or even on a bright moonlit night, it was useless. As soon, therefore, as there seemed a chance of producing a boat which could navigate under water, the heads of the various navies began to think of it as a possible "daylight torpedo-boat"—a name which is still used in the British Navy to describe a submarine. They argued that a boat

which had the power to conceal itself at will would be able, even on the brightest day, to approach the enemy unseen and fire off a torpedo at close range. For this reason the development of the submarine was watched with keen interest by naval men.

As in the case of so many other modern inventions, the French were the first to make practical experiments with submarines. Nearly thirty years ago—in 1888—they launched the *Gymnôte*, the first naval submarine, though it was not until five years later that they evolved the type of boat which was the foundation of the powerful flotilla they own to-day. Great Britain did not begin



SECTION OF A SUBMARINE.

to build submarines until 1901, during the South African War, when the first British submarine was launched at Barrow-in-Furness. These early submarines were all experimental; having got one vessel, it was the practice to test it, find out where its weak points lay, and endeavour to remedy them in boats subsequently constructed. Thus each new submarine that was launched differed in some way from the one before, the later ones being a great improvement on the early types.

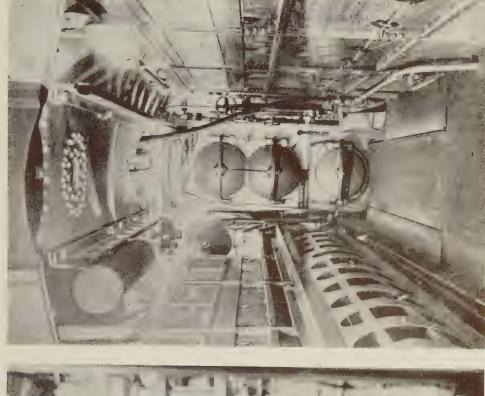
ON BOARD A SUBMARINE

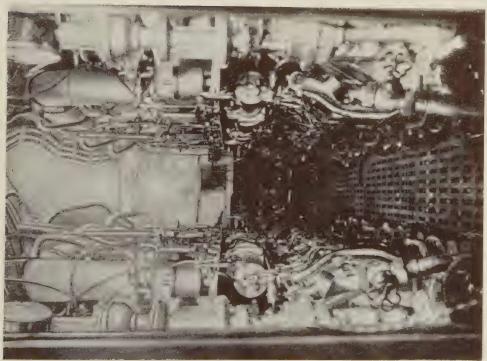
Life on board a submarine is not so unpleasant to-day as it was when these vessels first came into use. The earliest types of sub-

mersible boats were so small in proportion to the amount of machinery carried that there was little or no room left for the crew to move about in. Moreover, the atmosphere when submerged was often very disagreeable, the fumes of petrol mingling with the carbonic acid gas formed by expired breath. The modern submarine is larger; some of the latest classes have as much as 1500 tons displacement, compared with the 50 tons which was the average ten years ago. They can remain under water for a much greater length of time, but owing to the improvements that have been introduced the atmosphere never becomes so foul as it did formerly. Still, even to-day the life of a submarine crew is not an enviable one. It is lonely work and dangerous work, with little chance of either amusement or physical exercise to relieve the continuous strain under which the men live.

A modern submarine carries from twenty-five to thirty officers and men, as against ten or eleven carried by the earlier types. The boats are lit by electricity, and contain an ample supply of compressed air in cylinders. Air which has been breathed is absorbed by potash cartridges by means of a special purifying plant. Drinking-water is carried in tanks made for the purpose, and the food of the crews is cooked by electricity. When supplies of fresh food run short, there is tinned stuff to fall back on, and, as a matter of fact, this will often be the only diet available for days at a time, as there is very little room on board for the storage of fresh food.

Two different kinds of propulsive power are needed to work a submarine: petrol or heavy oil when the boat is on the surface of the water, and electricity when it is underneath. This causes the mechanism to be very complicated, and many attempts have been made, so far without success, to find some motive power which would be equally effective above and under water. Petrol cannot be used when the vessel is hermetically sealed up; it is, indeed, a dangerous thing to have on board at all, as the slightest leakage from the tanks, on mixing with the air, would cause a powerful explosive to be formed. Heavy oil is less dangerous, and as it has been found to give an increase of power, it is now being used in many of the more modern submarines. Electricity, the only satisfactory motive power when submerged, has also its perils. If salt water were to get at the storage batteries, poisonous gases would at once be





THE MOTOR ROOM.





A GERMAN SUBMARINE IN KIEL HARBOUR; A BRITISH SUBMARINE COMING TO THE SURFACE; A BRITISH NAVAL GUN MOUNTED FOR USE AGAINST AIRCRAFT; AND A GERMAN SUBMARINE MINE BEING LAUNCHED.

formed. To prevent such a thing happening, the batteries are now almost invariably enclosed in airtight cases.

Although every submarine must have a double set of engines, and the machinery as a whole is very complex, a great part of it can be stowed away in the two conical ends of the vessel, under the interior decking, thus leaving more room for the crew to live and move about in.

How Submersion is Accomplished

Every submarine can travel in three distinct "conditions": (1) the "light condition," when the vessel is on the surface of the water; (2) the "awash condition," when only the narrow deck and conning tower are visible; and (3) the submerged condition. To bring a submarine from the light to the awash condition, all that is necessary is to let water into the ballast tanks. The boat then sinks under the weight of the water to the required level. Complete submergence is attained by means of a system of horizontal rudders, called hydroplanes, which, when deflected, cause the submarine to dive slantingly downwards, nose first. These rudders work on the same principle as the ordinary vertical rudder. The latter, by the resistance it offers to the water, causes a boat to turn either to left or right, as the steersman may desire. The submarine's rudders, being horizontal, offer a different kind of resistance to water pressure, and the boat, instead of being turned to right or left, is forced downwards. Submergence can only be effectively carried out when the submarine is proceeding at full speed, as only then will the pressure on the rudder blades be sufficient to sink her.

To raise a submarine to the surface, all that is needed is a reversal of the rudders. Time can be gained, however, by emptying the ballast tanks at the same moment, for the rudders only carry the vessel to the awash condition, whereas with the ballast tanks empty it would rise at once to the light condition. A submarine cannot safely sink to a depth of more than 130 feet; at any lower level the great pressure of water would be apt to cause leakage. It can remain under water for as long as forty-eight hours at a stretch, though in actual practice twenty-four hours is seldom exceeded. Its speed when submerged is much less than when on the surface,

the latest types averaging 20 knots above water and 12 knots under water.

For a long time the value of submarine boats was minimised by the fact that when submerged they could see nothing of what was happening on the surface of the sea. The invention of the periscope put an end to this disability, and it is now possible for those on board a submarine to see both behind and before them for a considerable distance, while themselves remaining hidden from view under the water. The periscope, which is a long hollow tube projecting from the roof of the submarine, is generally maintained at a height of a few feet above the water. It is fitted with a number of lenses, so arranged that they cast a picture of all objects in the immediate neighbourhood on to reflectors inside the submarine. A periscope, being comparatively small, is difficult to detect in the open sea, and it can be drawn right under the water for a time, if the commander of the submarine deems this advisable for additional safety.

BRITISH SUBMARINES

The earliest British submarine was built to the plans of an American inventor, Mr. John P. Holland. It was called the No. 1, and was a small boat, intended chiefly for practice and experiment. It was followed by four vessels of the "A" class, with a submerged displacement of 180 tons, driven by petrol motors of 190 horse-power on the surface and electric motors of 80 horse-power when under water. These vessels were armed with three 18-inch White-head torpedoes and one bow tube, and their speed ranged from five knots an hour submerged to eight knots when travelling on the surface. All of them were scrapped before the beginning of the war, the oldest submarines now in commission being those numbered A5 to A13, but excluding the A7, which was lost off Plymouth at the beginning of 1914. The "A" class of submarine was intended solely for harbour defence, and is so employed to-day.

The "B" class, numbering eleven ships, was completed in the years 1904 to 1906. They were the first of the sea-going type of submarine, and their displacement when submerged is 316 tons, or nearly double that of the earlier "A" vessels. Their speed is twelve knots on the surface and eight knots submerged. They

carry sixteen officers and men, as against eleven carried by the "A" class. Each is fitted with two panoramic periscopes.

A great advance in submarine construction was made in the years 1906 to 1910, when thirty-eight ships of the "C" class were completed. Although their displacement is practically the same as in the "B" class, they can develop a speed of fourteen knots on the surface and over nine knots submerged, owing to the more powerful engines employed. The later "C" vessels are driven by heavy oil instead of petrol, and carry air-traps and safety helmets to facilitate the crew's escape in the event of any disaster when submerged.

Eight submarines of the "D" class were completed between 1908 and 1911. With the exception of the first two, all have a displacement of 620 tons, an approximate length of 150 feet, and a speed of sixteen knots on the surface and ten knots under water. These were the first submarines to be fitted with quick-firing guns for defence against aircraft. Before the vessel dives below the surface this gun, which is fixed on a disappearing mounting, can be lowered into a watertight compartment specially designed to receive it. The "D" class of submarines carry twenty-one officers and men, and have a cruising range of 4000 miles on the surface. They have torpedo tubes at bow and stern, with six 18-inch Whitehead torpedoes.

The British submarines of which most has been heard during the war are the "E" class, comprising eighteen ships, constructed between 1912 and 1914. Their speed is the same as that of the "D" class, but they have a range of 5000 miles, and carry two quick-firing guns on disappearing mountings and four torpedo tubes. They are all equipped with wireless telegraphy, and have three periscopes. Their displacement is 800 tons. "E" class submarines are able to go to sea in the roughest weather, and altogether are a great improvement on anything which preceded them. The two Australian submarines, AE1 and AE2, which made the 13,000-mile voyage from Barrow to Sydney under their own power, were exactly the same in every respect as the British "E" class.

At the beginning of the war a new type of submarine, to be called the "F" class, was in course of construction, as well as some very large and powerful vessels which for the first time in the history of British submarines have been given names. Great Britain had

then a submarine fleet numbering 82 ships; France, 92; Russia, 37; and Germany, 36. These numbers have since been added to in each case.

THE SUBMARINE IN WAR

Submarines were originally intended for coast and harbour defence only. But as improvements were introduced, and the speed and power of independent action increased, it was realised that they could also be employed in offensive work against enemy vessels. Now they have undergone for the first time the actual test of war, and though at present we are not permitted to know exactly what they have done and failed to do, the official reports issued by the Admiralty from time to time give us some idea of the variety of

duties which underwater craft are capable of accomplishing.

We are told, for instance, that three hours after the outbreak of war, submarines E6 and E8 carried out a reconnaissance in the Heligoland Bight, returning with useful information. know that during the transportation of the British Expeditionary Force the Lurcher and Firedrake and all the submarines of the Eighth Flotilla occupied positions from which they could have attacked the German High Sea Fleet, had it come out to dispute the passage of our transports. This patrol was maintained day and night without relief until the whole of our army had been transported to France and all chance of effective interference had disappeared. Later on, the same submarines were kept constantly employed off the enemy's coast, in the Heligoland Bight and elsewhere, and obtained much valuable information regarding the composition and movements of the German patrols. Though hunted for hours at a time by torpedo craft and attacked by gunfire and torpedoes, they made themselves at home in enemy waters and proved the value of the submarine as an ocean scout.

Towards the end of August 1914, submarine craft were engaged for the first time in battle operations, and their doings were thus chronicled by Commodore Roger Keyes in his illuminating dispatch: "At midnight on 26th August I embarked in the Lurcher, and, in company with Firedrake and submarines D2, D8, E4, E5, E6, E7, E8, and E9 of the Eighth Submarine Flotilla, proceeded to take part in the operations in the Heligoland Bight arranged





AN INCIDENT OF THE HELIGOLAND FIGHT: A BRITISH BOAT'S CREW, WITH



ORS OF A SUNKEN GERMAN VESSEL, RESCUED BY A BRITISH SUBMARINE.



for 28th August. The destroyers scouted for the submarines until nightfall on the 27th, when the latter proceeded independently to take up various positions from which they could co-operate with the destroyer flotillas on the following morning. At daylight on 28th August the Lurcher and Firedrake searched the area through which the battle-cruisers were to advance, for hostile submarines, and then proceeded towards Heligoland in the wake of submarines E6, E7, and E8, which were exposing themselves with the object of inducing the enemy to chase them to the westward. On approaching Heligoland, the visibility, which had been very good to seaward, reduced to 5000 or 6000 yards, and this added considerably to the anxieties and responsibilities of the commanding officers of submarines, who handled their vessels with coolness and judgment in an area which was necessarily occupied by friends as well as foes. . . .

"Lieutenant-Commander Ernest W. Leir, commanding submarine E4, witnessed the sinking of the German torpedo-boat-destroyer V187 through his periscope, and, observing a cruiser of the Stettin class close, and open fire on the British destroyers which had lowered their boats to pick up the survivors, he proceeded to attack the cruiser, but she altered course before he could get within range. After covering the retirement of our destroyers, which had had to abandon their boats, he returned to the latter, and embarked a lieutenant and nine men of Defender who had been left behind. The boats also contained two officers and eight men of V187, who were unwounded, and eighteen men who were badly wounded. As he could not embark the latter, Lieutenant-Commander Leir left one of the officers and six unwounded men to navigate the British boats to Heligoland. Before leaving, he saw that they were

provided with water, biscuit, and a compass."

How Sir David Beatty and his gallant fleet followed up this action by the "mosquito craft," and joined battle with the Germans in the Heligoland Bight, is now a matter of history.

PATROLLING THE SEAS

That our command of the seas is due, in the first place, to the powerful battleships and cruisers of the Grand Fleet, any submarine officer would readily admit: nevertheless, it is the smaller vessels

that protect our shores from periodical bombardment by raiding squadrons under cover of night. The Grand Fleet cannot be everywhere at once; the admiral must keep the bulk of his forces united and ready at any moment to meet an attack by the enemy. Hence it is on the submarines and destroyers that the duty of patrolling the coast must chiefly fall. The Germans may evade their vigilance now and then, as for instance when they made their murderous attack on Scarborough and other East Coast towns; but they know the risk they run in so doing, and do not attempt it too often.

A modern submarine, as the war has made sufficiently clear, is an opponent which even a Dreadnought may well treat with respect. Most of these vessels now carry four bow and two stern tubes, with eight or ten torpedoes of long range and high explosive charge. This enables them to fire half a dozen shots ahead and two astern. Should a submarine be counter-attacked by a large ship, her commander would probably dive right under the latter, and, ascending to the proper level on the other side, fire off his stern tubes at close range. The quick-firing guns mounted on the deck of the latest type of submarines, though of course of little use against a big warship, have several times been employed very effectively against other craft, including torpedo-boats and destroyers, as well as airships and aeroplanes. During the operations at the Dardanelles one of our submarines in the Sea of Marmora shelled a Turkish troop-train with its quick-firers, blowing up the ammunition wagons attached to the train. It also did great damage to enemy shipping, and blocked the railway line near Kava Burnu by bombarding it from the sea.

At the beginning of the war there was keen competition among officers commanding British submarines to be appointed for patrol work in the North Sea. This meant, in a good many cases, service in the Heligoland Bight, where a close watch could always be kept on the enemy's movements. Great daring and enterprise were shown by our submarines in carrying out their instructions, and also in facing the westerly gales which were then at their height. As Commodore Keyes remarks, the position of the submarines on a lee shore, within a few miles of the enemy's coast, was anything but a pleasant one. The short, steep seas which accompany westerly gales in the Heligoland Bight made it difficult to keep the conningtower hatches open. There were times when no rest could be

obtained, and even when cruising at a depth of sixty feet the submarines were rolling a good deal, and "pumping"—i.e. moving up and down for twenty feet or so. The commodore in his report warmly praised the commanders for maintaining their stations under such difficult conditions.

METHODS OF SUBMARINE ATTACK

Unlike other war vessels, the submarine can best deliver a surprise attack in daylight. After nightfall her periscope is useless, and her only chance of a successful action is to come to the surface and steal up to the enemy under cover of darkness, as an ordinary torpedoboat does. This course has been adopted pretty frequently in the present war, and it seems probable, therefore, that the submarine will soon displace the torpedo-boat, and the one type of vessel be employed for both day and night attacks.

The chief difficulty which the submarine must overcome when attacking submerged is that of speed. As we have already explained, the under-water speed, even of the latest classes, is only a little more than half the surface speed. This means that in dealing with any fast, or even moderately fast, surface vessel the submarine is greatly handicapped. The extreme range of the Whitehead torpedo used in the British Navy is 4000 yards, or about two and a quarter miles; it therefore follows that the submarine must get within this range before it is able to strike.

One of the methods commonly employed is to select a spot where the enemy is likely to pass, and there lie in wait for him. The periscope of a submarine is so small that it cannot easily be sighted from the deck of a hostile warship, whereas the latter would be visible to the commander of the submarine while still a long distance away. If the warship were steaming straight for the ambush, there would be nothing to do but wait till it got within range; but if it were going to pass at some distance, the submarine might decide to head it off at a certain point. In the latter case, it might be deemed advisable to submerge even the periscope, and the commander would take his bearings with a compass and go ahead under water until he was somewhere near where he wanted to be. He could not, however, be sufficiently sure of his whereabouts to fire a torpedo with

any chance of success unless he first rose to the surface and had a look round. This, though it may appear a dangerous manœuvre in the near presence of the enemy, is not really so. By means of her horizontal rudders a submarine is quickly raised to the awash condition, and as quickly lowered again beneath the water. The commander requires only a few seconds to take in the position of the hostile warship, and almost before a gun can be trained on the submarine it has been swallowed up by the sea. So quickly, indeed, is this operation performed, that it is known among sailors as the "porpoise dive." In the latest types of submarines it is not often resorted to, the three periscopes with their wide range of vision making it unnecessary to rise to the surface for any purpose.

ACTION AGAINST SUBMARINES

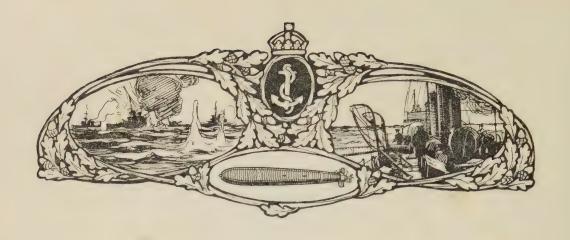
If the war has shown us what the submarine boat can do when commanded by brave and enterprising officers, it has also made it clear that there are means of circumventing these craft. A merchant ship can, for instance, reduce the dangers of submarine attack to a minimum by running at full speed on a zigzag course. There was the case of the steamer Anglo-Californian, which was attacked by the German submarine U39, on Sunday, 4th July 1915. Her captain kept her moving in circles, which made it very difficult for the Germans to secure a hit, although they were navigating on the surface. They aimed at the bridge of the Anglo-Californian with their machine-gun, and tried to sweep the deck underneath. The steamer's skipper fell, but still she held on her zigzag course without slackening speed. Then the Germans brought up a Maxim and clamped it to the top of the conning-tower. It riddled the bridge and funnels of the steamer with a furious fire, killing several of the crew. But those who were left fetched out rifles, and soon bullets were raining on the deck and spattering the conning-tower of the submarine. In the meantime, the Anglo-Californian had sent out a wireless call for help; it was answered by a number of destroyers, which put in an appearance just when the fight was at its fiercest. The submarine immediately dropped below the surface and made off, and the merchant ship was saved.

Warships as well as merchantmen have foiled the efforts of

submarines by a skilful use of the helm. In his dispatch after the battle of the Heligoland Bight, Sir David Beatty tells how, at 11 a.m. on the 27th of August 1914, his squadron was attacked by three submarines. "The attack," says the Admiral, "was frustrated by rapid manœuvring." Later in the same day the British battle-cruisers turned to the northward, and the Queen Mary was again attacked by a submarine, as was also the light cruiser Lowestoft. Both attacks were thwarted by the use of the helm.

Offensive action against submarines presents difficulties, but that it can be successfully carried out has been proved more than once. A periscope, though only some three inches in diameter, can be hit by a good marksman firing from an elevated position on the forepart of a warship. With her periscope gone, the submarine is like a soldier suddenly deprived of his eyesight, and can be run down or shot down without much trouble. The torpedo-boat-destroyer is the chief enemy of the submarine. These craft, with a speed of thirty knots or thereabouts, have not much to fear from the slower-moving submersible boat, and in most of the important engagements of the naval war they have been employed for the protection of battleships and cruisers.

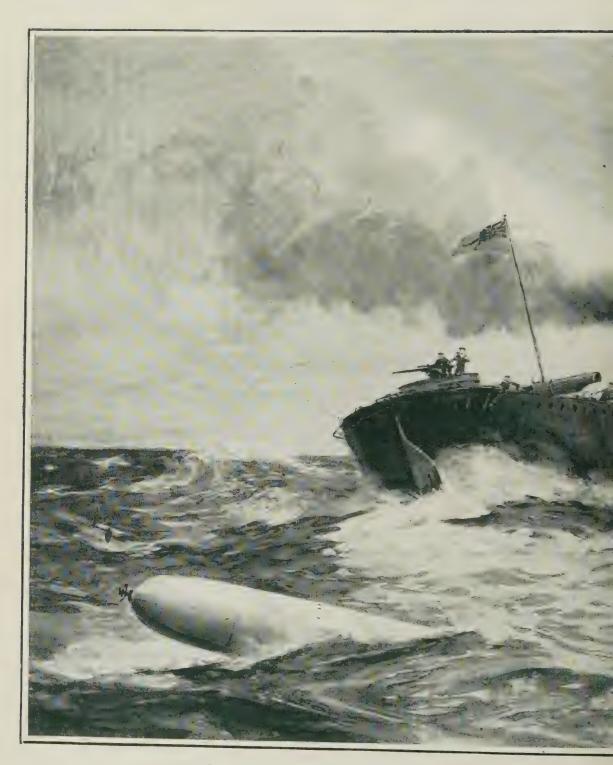
A fight between a flying machine and a boat navigating under the seas would have been laughed at a few years ago as too far-fetched for belief. Yet it has actually taken place. The airman was Squadron-Commander Bigsworth, of the Royal Naval Air Service, and the submarine was a German one. Commander Bigsworth flew over it, manœuvring for a position from which he could drop a bomb. In spite of heavy anti-aircraft fire from shore batteries and from the submarine itself, he descended 500 feet until he was in a good line for dropping his bombs with full effect. At last he succeeded; one of the bombs struck the boat, and it sank almost immediately. For this unprecedented feat Commander Bigsworth was awarded the D.S.O.



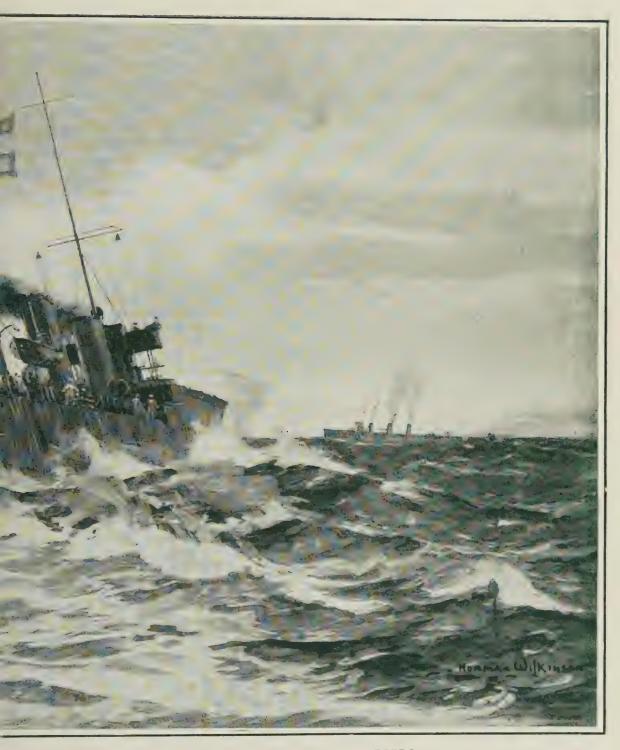
ONE of the fishes inhabiting the Mediterranean is the Torpedo or Electric Ray which, like the Gymnotus or Surinam Eel found in South America, and the Silurus electricus found in Africa, possesses the power of giving "shocks." The true nature of these shocks remained long unknown, but was finally proved to be electrical by Muschenbrock; it being shown that the anatomical structure of the fishes in question comprises a large number of membranous tubes divided into minute cells which act like those of a galvanic battery and generate currents of electricity of high tension. In the case of the gymnotus, indeed, the electric discharge is capable of killing large animals. When, therefore, in the progress of naval warfare it was found possible to construct weapons that could move about under water and could, at will, inflict terrible shocks upon the enemy, the analogy to the electric fishes at once became apparent, and the best known of these, the Torpedo, gave its name to the new device.

The original form of the torpedo was what we should now call a "mine." A thin metal case was filled with gunpowder to such an extent as would permit of its floating just awash, and was provided with a projecting firing device operated by contact. It was then allowed to drift with the current, or the tide, against the enemy's ship, or it was towed at the end of a long cord in such a way as to be guided into the most favourable position for explosion. Then came what was called the "spar torpedo," that is to say, a contact-fired case of explosives fastened to the end of a long spar projecting





BY MAINTAINING A HIGH RATE OF SPEED, AND FREQUENTLY



G HER COURSE, A SHIP MAY AVOID DESTRUCTION BY TORPEDO.



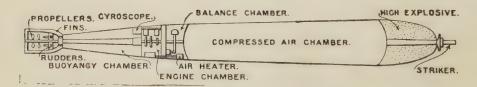
slightly downwards from the bow of a boat which at night-time or in fog was rowed towards the ship marked out for destruction. None, however, of these first attempts at torpedo-making was really successful. For more than a hundred years they were tried at intervals and proved to be comparatively innocuous.

In 1865 the writer of these lines was the guest of an English engineer at Fiume on the Adriatic, and had the interesting experience of witnessing the production of a weapon that has completely changed the whole aspect of naval warfare. The engineer in question. Mr. Robert Whitehead, of Manchester, was the managing owner of the Stabilimento Tecnico at Fiume, a factory for the construction of engines and other machinery required for the Austrian fleet and Austrian ships generally. He had, in 1864, acquired an interest in a patent granted to Captain Lupins of the Austrian navy for a self-propelled torpedo which could be guided by means of lines from a station on shore; and he set himself the task of improving this invention into a device that should be vastly more practicable and formidable. First and foremost, he decided to do away with all connecting lines, ropes or wires, and to give the torpedo a free run; and this naturally led to its being "fired" from a tube, just like a shell from a gun. Secondly, he replaced the comparatively feeble clockwork mechanism employed by Captain Lupins by exquisitely-designed engines of his own contriving, run by compressed air stored in the body of the forpedo and actuating double screws in its tail. A system of ingeniously-disposed fins and rudders was provided for guiding the course of the weapon both horizontally and vertically. Finally, the "secret chamber" was added, namely, a compartment in which was placed a contrivance fixing the depth of submersion, so as to prevent the torpedo from passing underneath the vessel aimed at, and to ensure its blow being delivered against the unprotected area existing between the keel and the lower edge of the side armour-plating.

Thus was evolved the Whitehead torpedo, which may be said to hold the entire field of all such weapons; for although other self-propelled torpedoes have been invented since 1865, and are more or less employed in warfare, they are but variants of the original idea of a "fish" torpedo; and, indeed, they are all more or less dependent on adaptations of Mr. Whitehead's guiding and controlling

devices. It must not, however, be thought that the Whitehead torpedo itself remained unchanged. The 1865 pattern was a baby compared with the pattern in use during the Great War. It was but 14 inches in diameter, and carried a charge of only 18 lb. of dynamite; while its speed did not exceed 6 knots, and its range was less than 1000 yards. The torpedo of the present day is very different. Its diameter is 21 inches, and its charge is from 300 to 500 lb. of gun-cotton or tri-nitro-tolnol: it has a speed of 45 knots for the first 1000 yards of its swim, and still retains a velocity of 28 knots even when at a distance of 4000 yards from the point of discharge. It can be aimed and used efficiently at ranges up to 6000 yards (nearly 3½ miles).

"But even in its earlier stages," says a British naval officer, "the torpedo had an enormous moral effect. Everyone has a decided objection to being blown up. Men on board a warship have the feeling that if it comes to shooting it will be the other fellows who will be hit; but when it comes to the bottom of the ship being blown out and all hands proceeding to Davy Jones's locker in company, they like the prospect appreciably less. Since the world began there has never been anything that has cost as much in a given time as has this ingenious invention of the late Mr. Whitehead.



In the case of our own country, not only is the torpedo fitted in under-water tubes in all our big ships, but it has a fleet of its own, made up of destroyers, torpedo-boats, and submarines, which alone in prime cost and upkeep disposes of a large number of millions sterling per annum. Nor is this all. Those shortlived monsters, the battleships, which to-day are and to-morrow are scrapped on the Motherbank or in the Kyles of Bute, must at all hazards be protected from these pestilent things. It is of no use spending two millions on a super-Dreadnought to have her severely damaged by a torpedo costing only a few hundreds of pounds, so, wherever she may be lying, she must be safeguarded from under-water attack."

THE MECHANISM OF A TORPEDO

The accompanying diagram shows the general construction of a modern Whitehead torpedo. This is a large steel tube rounded at the head and tapered towards the tail so as to give the whole contrivance a form resembling that of a cigar or cylindrical fish. Inside the tube at the front end is a charge of high-explosive which is detonated by the action of a striking-pin when the torpedo strikes a hard object such as the side of a ship. At the rear end are two propelling screws mounted on a shaft which is supported by a frame that is capable of revolving and acts as a guiding fin, while twin rudders, the "posts" of which are held in place by the propeller shaft, serve to correct the swim of the torpedo in a horizontal sense. But in order that this may take place, the rudders themselves have in their turn to be controlled—a requirement which is met in a very ingenious manner. The torpedo is provided with a gyroscope, that is to say, with a heavy-edged disc or flywheel, the axle of which is parallel to the axis of the torpedo itself. At the moment of discharge from the firing tube this axis is, of course, aimed in the precise direction to be pursued by the torpedo in order to strike the enemy, and the gyroscope is at the same time caused to rotate on its axle very rapidly indeed. Now it is found that a heavy rotating disc or wheel opposes great resistance to any change in the direction of the plane of its rotation, and thus maintains its axle also with its original direction unchanged. If, then, the torpedo as a whole should become deflected from its aim, the axle of its gyroscope does not participate in the swerve, but, by means of an interposed "steering engine," holds the rudders fast, and thus speedily brings the weapon back into the right direction.

There is also what is termed a balance chamber, in which is placed the contrivance for maintaining the torpedo at any desired depth from surface; the means of regulation employed being the greater or less pressure of the surrounding water according to whether the weapon is submerged much or little, and the operative effect being a variation in the amount of water allowed to remain in the

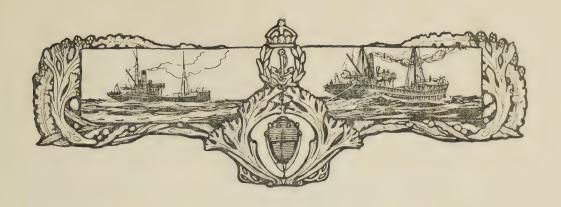
buovancy chamber.

Finally, there is the air-heater, which is placed between the compressed air chamber and the engines, and thus obviates the loss

of power that would otherwise ensue by the reduced temperature always attendant upon the expansion of a gaseous body.

Torpedoes are shot out from "torpedo-tubes," which may be placed on the upper deck of the vessel employing the weapon, or may be inside the hull below the water-line. In the former case the loading, aiming, and firing are much simplified; but the torpedoes are exposed to the chance of being struck and exploded by the enemy's fire, and, in addition, the fall of the torpedo through the air into the water is apt to interfere with the action of its delicate mechanism, and may produce a deflection of aim beyond control by the gyroscope. When submerged tubes are used they are generally stationed athwart the vessel, and, in that case, the torpedo, if unprotected, would run the risk of being turned aside from its proper course by the swirl of water against its head before its tail could issue clear of the tube. It is found necessary, therefore, to provide a bar or "spoon," which is thrust out from the ship's side just previous to firing, and screens the torpedo until the latter emerges completely. It is, of course, also necessary to provide the fore end of the tube with a sluice valve which remains closed while the torpedo is being inserted through the breech or, more often, through a side door, and is opened when the weapon is in place and the tube made tight for firing—this being effected by means of a small charge of gunpowder or cordite or a gust of compressed air. The firing charge is very light, as all that is desired is to eject the torpedo from the tube, its progress when in the water being provided for by its own engine and propellers, which are started (together with the gyroscope) automatically by the discharge of the weapon. Another automatic device also simultaneously releases the striking-pin in the nose of the torpedo, and renders it capable of being forced in, and thus igniting the bursting charge whenever an object of sufficient volume and hardness is struck.

Torpedo-tubes are usually fixed to the vessels. They have, accordingly, to be aimed by steering the ship in such a way as to bring them to bear on the enemy. It is customary, therefore, for them to be fired, electrically, by an observing officer stationed on deck or on the bridge; the tube-crew below being, of course, duly warned to stand by.



THERE is one branch of the naval service which is of vast importance, and yet comes in for a very small share of public knowledge and approval. It is as essential for the protection of the Fleet as this latter is for the protection of the Empire. Modern naval warfare has seen the development of weapons against which no warship, in spite of all its armour and heavy guns, can oppose any adequate defence. These weapons are mines, torpedoes, and submarines. They are not absolute novelties: they have been known for more than a century: they have all been used in wars of the bygone past; but never before the Great War did they, to use an expressive phrase, "come into their own." In the struggle of 1904-1905, between Japan and Russia, more than one huge battleship was destroyed by striking a floating mine or was mortally hurt by the impact of a torpedo. These, however, were pretty generally regarded as successes due more to chance and carelessness (on the part of the injured) than to design and skilful handling; and most naval authorities remained of the opinion that no good case had been made out for any decided change in preparations, strategy, or tactics. When, therefore, on 5th August 1914, the German mine-layer Königin Luise was sunk by H.M.S. Amphion, and when on the succeeding day the Amphion foundered through striking a mine, these incidents being followed by several others of a like character, culminating, on 22nd September, in the loss by torpedo-attack of the three British cruisers Aboukir, Hogue, and Cressy, the Admiralty found themselves confronted by a new set of problems requiring new fighting methods and new appliances.

We need not here dwell upon the general aspects of the case,

namely, the withdrawal of the battleships from the open sea into a line of harbour positions defended by mines and covered by far-flung lines of scouts, patrols, and cruisers, thus presenting a striking analogy to the transformation of land warfare into an affair of trenches and entanglements. What concerns us more is to give some account of the new features that have consequently been added to the British Navy.

MINE-LAYERS

In the first place, there are the mine-layers, consisting of seven old cruisers of the Apollo class (second class, built in 1891, carrying eight guns and having a displacement of 3400 tons), together with a miscellaneous assortment of other vessels that have been added from time to time. The business of these ships consists in proceeding to any river-mouth, coastal district, or sea area that may be chosen by the authorities, and there to lay mines in such a way that no enemy vessel unprovided with a chart of the mines can navigate the waters in question without incurring the risk of destruction. To understand this, it should be borne in mind that a sea-mine is a case filled with explosive substances and fitted with contact-firing arrangements which come into action so soon as the mine is struck by any hard body. Sufficient air space is left within the case to make the mine buoyant; so that when attached by a cable to an anchor it rises as far as the length of the cable will allow, and thus can be retained in position at any desired depth from surface. depth is usually so adjusted that the mine cannot be seen from the deck or bridge of an approaching ship, and yet will be struck by the immersed hull of the ship. In addition to the anchored weapons of destruction here described, mines are sometimes laid which float freely (just awash so as to be as little visible as possible), and are carried hither and thither by the waves and currents; but the objection to them is that they annoy and injure all parties alike, and are just as much of a menace to neutrals as to belligerents.

MINE-SWEEPERS

Next to mine-laying comes the business of mine-removing; and for this purpose the Admiralty at first fitted up some of the old "torpedo gunboats," the original type of vessel employed to chase



THE SINKING OF THE ABOUKIR.



and sink torpedo-boats. But it was soon found that in the fishing ports of the country there existed great numbers of craft of a character much more suitable for the service in question. These were the steam-trawlers employed by fishermen for hauling trawls and other drag-nets through the sea and along the bottom. Now, as mineremoving could be best effected by hauling a horizontally-suspended cable so as to cross the vertical mooring cables of the mines, it was clear that a steam-trawler filled admirably the requirements of the Accordingly the fishermen and skippers of Grimsby and other ports were called upon to volunteer for the arduous work of "minesweeping," as it was termed, and their vessels were hired and commissioned accordingly. They became just as much a part of the Navy as any battleship; and it may be said with truth that they have seen much more of active service than has been the case with the gigantic armour-plated carriers of titanic guns. Their service, too, has been attended by circumstances of desperate peril. Not only is there the risk of the mines exploding when swept together in batches or when being secured after capture, but the trawlers themselves have become vessels of war, and are subject to destruction by the enemy without warning. They are not armed: they are not protected in any way; and their speed is too low to permit of escape by showing the enemy a clean pair of heels. We need not be surprised, therefore, to find that the steam-trawlers and their crews have suffered more in proportion to their numbers than has any other branch of the British Navy. Furthermore, their work has been more arduous than that of any other branch of the Service, not excepting the patrols, which are popularly supposed to encounter a maximum The mine-sweeper deliberately looks for the most exposed and dangerous areas in which to operate: he has to be perpetually on the alert by day and by night, and in all weathers: he is always exposed to attack by the enemy; and when no enemy is near he has to seek for dangers of a particularly perilous kind. captains and crews of the steam-trawlers engaged by the Admiralty have one and all proved themselves heroes of the loftiest character, that is to say, heroes who calmly go about their duties from day to day, looking Death in the face on every side, and not supported by the fire of combat or the knowledge that they are under the eyes of their fellow-countrymen.

Mine-removing, however, does not complete the tale of the new efforts and organisation imposed on the Admiralty by the new phases of naval warfare to which we have referred. The terrible menace of the submarine has also to be met. This menace was well set forth by Admiral Sir Percy Scott in the historic letter he published some two months before the Great War. He therein said, among other things, "No man-of-war will dare to come even within sight of a coast that is adequately protected by submarines. . . . It will not be safe for a fleet to put to sea. . . . Submarines and aeroplanes have entirely revolutionised naval warfare: no fleet can hide itself from the aeroplane eye, and the submarine can deliver a deadly attack, even in broad daylight. . . . Naval officers of the future will therefore live either above the sea or under it. It will be a Navy of youth, for we shall require nothing but boldness and daring. . . . Not only is the open sea unsafe. With a flotilla of submarines I would undertake to get into any harbour and sink or materially damage all the ships in that harbour."

It is to be supposed that in writing thus, Sir Percy Scott had in mind the ultimate development of the submarine rather than its powers as existing at the date of his letter. If this supposition be correct, then it must be admitted that the actual happenings of the Great War have fully justified his warnings. The exploits of English and German submarines alike have shown in practice the vast scope and destructive possibilities of these new weapons, and have also taught the world that they are as yet in their infancy, and that in a very near future a further prediction of the gallant Admiral will be verified, namely, "The introduction of the vessels that swim under water has, in my opinion, entirely done away with the utility of the ships that swim on the top of the water."

HUNTING AND SWEEPING FOR SUBMARINES

The problem with which the Admiralty have thus had to deal has been one of no small difficulty, and has required much patient work and experiment. At first the chief efforts of the Submarine Defence Department were in the direction of watching for the emergence of submarines at surface, and then attacking them by gunfire or ramming. For this purpose the fastest of the torpedo-boat-

destroyers were chosen, and were provided with observing stations and light quick-firing guns automatically trained to correspond with the observing instruments. The bows of the destroyers were also strengthened, so that their commanders might with impunity dash forward and ram any submarine seen at surface before it could dive below; and as a period of from five to ten minutes is required for a submarine to pass from the "awash" condition to the complete submersion of her conning-tower, while a destroyer can, in the same interval of time, cover a distance of from three to six miles, it was thought that but few of the enemy's under-water craft would escape when once they happened to be sighted by a British Defence vessel. Sundry successes were, indeed, scored in this way.

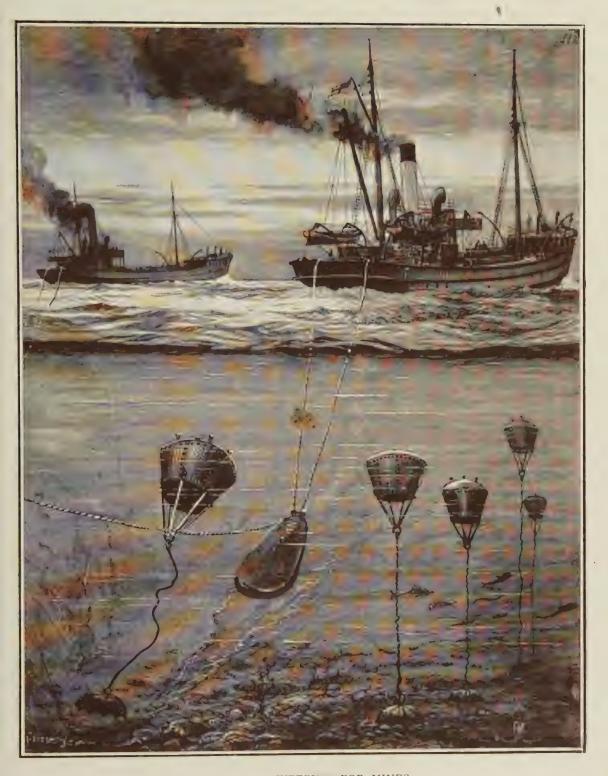
It was found, though, that to rely upon sighting submarines or even the tops of their periscopes at surface was not a very effective method of defence as regards the destruction of the enemy, even though it made escape from their attacks a comparatively easy matter. What was wanted was a system of fighting the submarines while still under water; and this necessity led to the adoption of different tactics, the results of which, we have every reason to believe, have been highly satisfactory. Very fast vessels have been constructed and equipped since the outbreak of the war for the specific purpose of hunting down submarines. The principle on which they operate is very similar to that employed by mine-sweepers, although, of course, the actual apparatus is different to suit the different kind of fish it is hoped to sweep into the net.

With regard to defence against torpedoes, the problem does not involve the employment of any special vessels. Torpedoes, though automobile and independent when once on their way, cannot be used without some base of operations from which to launch them on their career of destruction. This base, in practice, takes the form either of a vessel at surface or of a submarine below. The defence against submarines has already been described. That against craft navigating the surface is a matter of ordinary sea-fighting to be carried out by the established types of ships in the Navy—battleships, cruisers, destroyers, and the like. Speed is, of course, the chief tactical method relied upon. In all cases where torpedo-attack may be apprehended the regulations require the captains of warships to keep their vessels in rapid movement, and not to rely entirely

upon the scouting efficiency of the screen of light cruisers and destroyers by which a fleet or squadron is always surrounded. Then, too, in daytime, the seaplanes of the naval air service fly far and near and round about at no great height from the surface of the ocean with the view of discovering any mines and submarines that may be in the vicinity; and if the water be not too rough or too turbid it is found comparatively easy to detect the dangers in question and to signal their presence to the "Sweepers" or "Hunters" charged with the duty of their destruction.

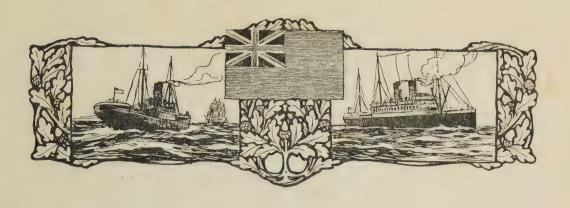
A new development of the Navy is therefore taking place, and a line of activity is being opened up which calls for officers and crews of a type somewhat different from the ships' companies of past times. They have, on the whole, to be younger. They have to rely more on their own initiative than on orders. They have to be exceptionally active, hardy, and enduring. Each man has to be a resourceful engineer as well as a most complete seaman. And, what is perhaps above all, the very spirit of discipline has to be rooted in their hearts. In such small craft as those they man, familiarity must needs exist; but it must never breed contempt. This point has been well put by a distinguished Admiral who tested the matter by taking more than one trip in a coastal torpedo-boat, and wrote: "The officers that is to say, the lieutenant in command, the gunner, and the engineer officer—are never out of sight, touch, and hearing of the men whom they command: those who know what naval discipline is will acknowledge that to neither the officer nor the man can a higher test be applied. Necessarily the formal and ceremonious side of discipline, so evident in the big ships, is here conspicuous only by its absence; in a torpedo-boat in half a gale in the North Sea that salute to the quarter-deck which every officer and man gives on arriving at that sacred spot in the larger units of the Fleet cannot be accomplished as officer or man struggles on deck, holding on with hands and feet while a liberal portion of the surrounding ocean pours over his head and down his throat."

We who have witnessed the birth of this new order of things at the call of the Great War have also witnessed with what high spirit and admirable success our sailors have sprung forward to show how, as in the time of Nelson, they rise to the great occasion of England's expectation, and day by day they do their duty.



TRAWLERS SWEEPING FOR MINES.

A DESTROYER COMMUNICATING WITH A MINE SWEEPER,



ENGLAND's command of the seas is not merely a matter of her warships. It is, to an even greater extent, that of her commercial marine. No nation is absolutely self-contained and self-supporting; and no great nation, in this age of the world, can exist without the aid of oversea communication and transport. Food, raw products for the supply of industrial establishments, fuel, and manufactured articles are all necessaries of existence; so that if any one power have the monopoly, or even a preponderating share, of the shipping required for carrying these necessaries from country to country it thereby becomes endowed with international control, and, if it have in addition an armed force sufficient to protect its shipping, it can impose its will upon the world at large.

When the Great War began in 1914 the mercantile fleets of the world comprised some 31,000 ocean-going vessels (24,500 under steam and 6500 under sail), having a total capacity of 50,000,000 tons. Nearly one-half of this tonnage was under the British flag, while the remainder was divided in very much smaller percentages among other trading nations, the principal of which were the United States, Germany, Norway, France, Japan, Italy, Holland, Sweden, and Russia. England, therefore, was easily supreme; and as her fighting navy was vastly more powerful than any probable hostile combination she remained mistress of the world's commerce.

THE MERCANTILE MARINE

This position of overwhelming might had been the result of centuries of effort on the part of the dwellers in the rough island

of the Northern seas. They had, slowly at first, and very rapidly afterwards, learnt and practised the arts of industry and trade. Their long seacoast with its many harbours had bred both sailors and ships of such quality—" heart of oak "—as the world had never before seen. They had braved not only the dangers, but the robbers, of the deep; and when they had smitten the pirates they defied the navies of all other peoples. But they carried fair-dealing as well as sound merchandise into distant ports; and presently the flag of England became a welcome visitor in every harbour of the world, and an emblem of friendly intercourse, pleasant and profitable to all parties alike.

It is, however, only within the lifetime of persons now living that the British mercantile marine has soared to such a height of power and influence. The introduction of steam-vessels and the consequent supersession of sailing-ships took place just when England had become a great manufacturing nation, and before the rest of the world had recognised the vast importance of coal and Curiously enough, the then comparatively insignificant colony of Canada was the first community to build an ocean-going steamship, the Royal William, launched at Cape Cove, Quebec, in Two years after her launch she made the perilous adventure of a voyage across the stormy North Atlantic, from Picton in Nova Scotia to Gravesend on the Thames; a voyage which she safely accomplished in twenty-five days. In 1838 another attempt at oceansteaming was made; this time in the reverse direction. The packet Sirius left Cork on 5th April and reached New York on 23rd April, after having been compelled to burn everything combustible that could be sacrificed without imperilling the safety of the vessel. On the same day, 23rd April, there steamed into the harbour of New York the Great Western, a paddle-wheel boat which had left Bristol on 8th April, her passage having thus been effected in fourteen and a half days. A new and wonderful chapter of the world's history had begun.

Space does not admit of our attempting to narrate the further growth of British shipping, but the figures we have already cited prove its rapid and astonishing character. There is no room for wonder, therefore, when we find that, on the outbreak of the Great War, the Admiralty had to direct much of their attention to the

problem of how best to protect British commerce and derive advantage in the actual conduct of warfare from the fact of there being so prodigious an English fleet in existence.

For very many years the naval authorities of all countries had recognised the importance of merchant shipping as a point of attack. Fast light cruisers were built for the purpose of raiding or "commercedestroying," as it was called. Other cruisers, faster and more heavily armed, were built for the destruction of the raiders and for patrolling and protecting the main routes of ocean travel. And the merchant shipping itself was called into requisition. The British Navy, in particular, invited the captains and officers of the mercantile marine to accept commissions in a "Royal Naval Reserve." and thus to be available in the event of war; while the leading shipowners were asked to enter into agreements to hold all their vessels for the time being at the disposal of the Government for hire or purchase. And in the case of new vessels it was arranged that they should be constructed in such a way as to be readily armed when required for active service. Among these Royal Naval Reserved Merchant Cruisers there figured in the Navy List the illfated Lusitania and her sister ship the Mauretania, both being owned by the Cunard Company, and being permitted to fly the blue ensign in addition to the Company being paid a yearly subvention.

AUXILIARY CRUISERS

Immediately on war being declared the Admiralty took action under the various agreements in force, and by virtue of further powers granted by Parliament acquired many additional ships. The Navy therefore was suddenly expanded by the putting into commission of many large cruisers which, although quite unprotected as regards armour-plating, were well-armed and were fast enough to be able to fight at whatever range might suit them—the advantage that counts above all others in an engagement at sea, where speed nowadays is the equivalent of "having the weathergauge" in the days of the old sailing-ships.

These "auxiliary cruisers," as they were officially designated, did very good service in many parts of the world. In September 1914 the Carmania encountered a German merchant cruiser, the

Cap Trafalgar, and though the two vessels were very equally matched, the British ship was so skilfully handled and the British guns were so long-ranged and so splendidly served by their crews that in less than an hour the enemy's flag was lowered and the survivors of the German crew were rescued from their sinking craft. Another enemy merchant cruiser, the Kaiser Wilhelm der Grosse, was also sunk by a British cruiser, with a loss on our part of only one killed and five wounded. The British auxiliary cruiser Otranto was present in the early stage of the battle off Coronel, and another, the Macedonia, took part in the operations attendant upon the battle off the Falkland Islands.

At the beginning of the war, 27 of the regular mercantile liners were taken over by the Admiralty and converted into auxiliary cruisers, in addition to which 10 were chartered for hospital purposes and 3 as hospital carriers; while 34 large merchantmen were requisitioned as general fleet tenders, and 107 steam-trawlers were commissioned to serve as mine-sweepers. These numbers were added to vastly in subsequent months, until the mercantile elements of the Navy became more than three times as many as its regular battleships, cruisers, torpedo craft, gunboats, monitors, and all other war vessels. The commercial marine, in fact, established its supremacy and showed itself to be indispensable to sea-power. The duties it discharged were both responsible and multifarious. It kept the warships supplied with coal, oil, munitions, and all other requirements. It fed and sustained the armies on foreign soil. It carried reinforcements across the seas and brought back such of the soldiers as were wounded, sick, or spent. Furthermore, in spite of its non-combatant character, it played a very important part in the active operations of the war. The great blockade of the Channel and Northern sea-routes by which supplies from the Americas and other oversea countries were accustomed to find their way to Germany was maintained principally by the requisitioned vessels of commerce. An interesting picture of this part of their work is given as follows by an American passenger on board the Oscar II. from New York to Copenhagen, when (in August 1915) that vessel was stopped by a British auxiliary cruiser and taken to Kirkwall. After describing the arrival of the vessel at the Scottish port and his visit to the harbourmaster's office, he says:

"Through the window a dozen of the Government's small harbour boats were to be seen, moored to the quay, and beyond them, dotting the harbour, more than a score of neutral merchant vessels. Some of them, like the *Oscar II*., on which I had just crossed, were detained only temporarily for examination of passengers or cargo. Others were prizes, to be held until the end of the war.

"These were the flies caught in the great web spun by the British across the northern trade route. Beyond the harbour's mouth, in the waters about these Orkney Isles, about the black Shetland Islands to the north, and the Hebrides to the south-west, along the eastern coast of Scotland and out across the North Sea towards the Norwegian shore, converted cruisers on patrol duty are for ever weaving their criss-cross courses, with Dreadnoughts waiting within easy call. More tenuous, but more far-reaching, are the strands woven by the wireless. They stretch three-quarters across the Atlantic and far across the European mainland, and are extended by the telegraph service of neutral and allied countries. I pictured a similar web centring at Dover in which all the Channel shipping becomes enmeshed; a third at Gibraltar which controls, even more effectually, traffic between America and the Mediterranean ports. And I got a vivid idea of the completeness with which England dominates trans-Atlantic intercourse. I understood for the first time what Englishmen mean when they declare that 'Britannia rules the waves.'

"Two days before we sighted land it was rumoured among the first-class passengers that a rendezvous had been made with an English warship for the morning of 7th August, at nine o'clock. Anyway, promptly at that hour, a converted cruiser was seen far ahead shoving determinedly towards our starboard bow. It had no name, carried no flag, and was painted a deep leaden black. A few minutes later a British naval lieutenant and six British seamen were on board, with a cask of provisions and some wine—a prize crew being forbidden to touch the ship's food. Our wireless was at once dismantled, the wireless house locked, and the key deposited in the lieutenant's pocket. A British sailor with loaded rifle stood guard at the steering-wheel; another patrolled the bridge where the lieutenant had now taken command; a third was in the look-out. But our Danish flag still hung from the stern."

After describing the formalities at Kirkwall and the departure of the vessel into the North Sea, the American passenger goes on

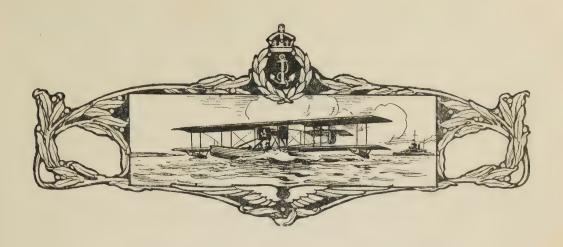
to say:

"Two days later, as we sailed up the pretty pine-clad fjord of Christiania, we met the Norwegian-American liner Bergensfjord. Her last trip across had been even more exciting than our own. For, after slipping through the English web unobserved and arriving safe within Norwegian waters, she had carelessly strayed out beyond the three-mile limit, been pounced upon by a British cruiser, and taken ignominiously back to Kirkwall. The British Admiralty had reported the matter to the owners of the Norwegian-American line, asking them to dismiss the captain. They had refused. Captain Hiortdahl, they declared, by passing through the dangerous waters as quickly as possible, was not only saving them money in coal and provisions, but was safeguarding the ship and the lives of the passengers. Besides, he was a good captain-otherwise he could never have given the British cruisers the slip as he had done three times out of every four since the war began.

"And then the captain—who is a good deal of a Viking—declared that he would keep on trying to run the British blockade just as before—that he would continue to order the ship's lights out as he came near the coast of Scotland, would continue to make a secret of the ship's daily run and her whereabouts, that the standing orders he had given his wireless operator not to send out any messages when near England, but to try to pick up anything passing between other ships and report at once anything he learned, were still in force. He declared he had the old-fashioned idea of the duty of

a sea-captain."

One wonders which to admire the more, the fine old Viking or his English cousins, the watch-dogs of the Northern seas.



In theory, every member of the Royal Naval Air Service is attached to H.M.S. *Pembroke*. As a matter of actual fact, very few of them have ever seen the ship, and the entry of their names under this head is merely a temporary expedient of the Admiralty.

The Naval Air Service, originally an offshoot of the Royal Flying Corps, is now larger than the military wing. It includes pilots, observers, mechanicians, transport men, wireless telegraphists, a section of balloon kites for observation work, anti-aircraft gunners for home and coastal defence, and many others. Until recently it was also responsible for an armoured car service, which in the early months of the war did good work with the army in France and Belgium. This, however, has now been disbanded.

It is not possible at the present time to give anything like a complete account of the organisation of the Naval Air Service. New duties have been imposed upon it since the war began; others have been taken away after a short period of trial. Mr. Balfour, soon after his appointment as First Lord of the Admiralty, publicly expressed his surprise to find that the Navy was responsible for the aerial defence of London. This is only one of the anomalies which will no doubt disappear in time; but at the moment of writing there would seem to be no clear dividing line between the duties of the Naval Air Service and those of the Royal Flying Corps, and since the beginning of the war we have had naval airmen co-operating with the army on land and otherwise usurping the functions which belong to the military branch.

The Naval Air Service, like the Royal Flying Corps, is divided into squadrons and flights. A squadron consists of three flights, each of which contains four aeroplanes. A squadron-commander is responsible for the work of the flights under his command; he appoints observers, forwards reports, and looks after the supply of spare parts and stores. A flight commander appoints pilots to aeroplanes and sees that machines are maintained in a good state of repair. Aeroplane pilots may be either sub-lieutenants or lieutenants, according to their skill and experience, but no non-commissioned officer is ever placed in full charge of a machine. In view of the increasing importance of the Naval Air Service, a rearadmiral was recently appointed to the chief command, in lieu of the commodore who had held that position during the first year of war.

AERIAL SCOUTS AND COAST PATROLS

Mr. Eugene Ely, an American pilot, was the first to prove that it was possible for an aeroplane to rise from and descend upon the deck of a warship. His experiments were followed by others on the part of Commander Samson, a British naval officer who, in May 1912, alighted with his Short biplane on the surface of the water and rose again without assistance. Since then a notable advance has been made in this branch of aviation. Scores of pilots now fly backwards and forwards across the sea, alighting on the waves and reascending with the same ease as on land. Warships have been specially fitted up for the conveyance of aeroplanes, with wide deck spaces and platforms from which machines can rise. Then, too, the development of wireless telegraphy has greatly increased the utility of the aeroplane employed in scouting work at sea. There is no longer any need for a pilot to return to a warship with news of the enemy's movements. It can be flashed back at once by means of his own wireless apparatus.

During the course of the war the Naval Air Service has rendered valuable assistance as aerial scouts in guarding our ships against a surprise attack by the enemy. In conjunction with destroyers and submarines they have been constantly on the watch for any move on the part of the Germans, scouring the seas every day over a radius of many miles.

While the Expeditionary Force was being moved abroad a strong patrol to the eastward of the Straits of Dover was undertaken by both seaplanes and airships of the Naval Air Service. The airships remained steadily patrolling between the French and English coasts, sometimes for twelve hours on end; while farther to the east, with the assistance of the Belgian authorities, a temporary seaplane base was established at Ostend, and a patrol kept up with seaplanes between this place and the English coast opposite. It was thus impossible for the enemy's ships to approach the Straits without being seen a long distance away. One of the special duties of these aerial scouts was to locate the presence of enemy submarines, which, when travelling submerged, cannot easily be seen from the deck of a surface warship. The aeroplane pilot, high up in the air, gets a clearer view of the waters beneath him, and so has a better chance of picking out the tiny periscope which is the only part of the submarine visible on the surface.

Naturally the work of the Naval Air Service cannot be carried on without great risk, and that not only from enemy guns. Aircraft are still delicate things, subject to unforeseen accidents when flying, and the man who goes up in one literally carries his life in his hands. That our airmen are willing to do all, and more than all, that is required of them has been made plain by the official reports, one of which tells how, during an airship patrol, it became necessary to change a propeller blade of one of the engines. The captain feared he would have to descend for the purpose, but two of the crew immediately volunteered to carry out this difficult task in mid-air. Having been given permission, they climbed out on to the bracket, carrying the propeller shafting, and completed the work of changing the propeller blade at a height of 2000 feet above the sea.

Naval aeroplanes have also been employed during the war as coast patrols for the defence of harbours and military works. Full information as to what they have done in this respect will not be available till after the close of hostilities, but it may reasonably be inferred that they have played a part in reporting the coming of Zeppelins to our shores and in driving them off again on the many occasions when these airships have tried to reach London and failed. Scouting and coast patrol work are two of the legitimate functions of the Naval Air Service; a third is to assist warships in

an attack on land fortifications. It is likely that, as time goes on, their duties will be confined within these limits, but in the meantime they have other and more spectacular parts to play.

RAIDS

Most of the British air raids on German territory since the beginning of the war have been planned and carried out by the Naval Air Service. Sometimes only one or two airmen were engaged; sometimes a whole fleet of machines have taken part in a bombardment of fortified positions or munitions factories. In the air raid of October 1914, when the airship shed at Düsseldorf was damaged and a Zeppelin destroyed, three British pilots earned the special commendation of the Admiralty. They were Squadron-Commander Spenser Grey, Lieutenant Marix, and Lieutenant Sippe, and the story of their exploit makes thrilling reading.

Antwerp at that time was still in the possession of the Belgians, and the three pilots told off for the raid started from there in the early morning, under heavy fire from the besieging Germans. Before they had gone very far, Lieutenant Sippe developed engine trouble and was forced to descend, but the other two held on their way. The weather was misty, and for a considerable part of the journey they could not see the ground or check their whereabouts. Once Lieutenant Marix descended to a lower level to investigate, and found himself only about a hundred feet above the tree-tops.

At last the two pilots arrived at Düsseldorf, where the Germans greeted them with heavy shrapnel and rifle fire. They continued on their way, however, until they reached the new airship shed, which was to be the chief object of their attack. Here Lieutenant Marix dived suddenly to a height of 500 feet, and for an instant the spectators thought his machine had been hit by shrapnel. But he had only come down to make more certain of his aim, as was apparent in another moment, when he released a bomb right over the roof of the shed. A gigantic burst of flame followed, and the air was heavy with smoke for about ten minutes, the result of igniting the gas of an airship. When the smoke had disappeared, a huge hole was observable in the middle of the shed. Lieutenant Marix dropped

some more bombs, and then, seeing that he had accomplished his work, turned about and flew back towards Antwerp.

Meanwhile Squadron-Commander Grey had gone on up the Rhine to Cologne, intent on seeking out the airship shed in that city. Unfortunately, the weather again turned misty, and he failed in his object, so, after circling overhead for some time, he let his bombs drop over the central railway station, where they did a good deal of damage. Both pilots arrived safely back at the aviation ground outside Antwerp, though Lieutenant Marix's petrol gave out while he was still ten miles from home, and he finished his

journey in a Belgian armoured motor-car.

While the airmen had been away, the German artillery had moved up closer, and were now busy shelling the aviation ground, so that they had only escaped one danger to run into another. In the morning they hurriedly moved into Antwerp, where they learnt that an order for the evacuation of the city had been given the previous afternoon. Their aeroplanes having been destroyed by shell-fire, they procured a motor-car and joined the stream of refugees making for the coast. The oil tanks were then alight, and when their car passed over the bridge the canal was a blazing river, with the flames leaping up over the parapet and scorching their faces. After many adventures on roads swept by German gunfire the three raiders and their men reached Ostend, where, in due course, they took ship for England in search of new machines.

A little over a month later another raid was made by British naval aeroplanes on the Zeppelin airship factory at Friedrichshafen. Again three airmen were concerned, one of them being Lieutenant Sippe, who had had such bad luck on the former occasion. The other two were Squadron-Commander Briggs and Flight-Commander Babington. All three pilots flew down to close range under a heavy fire from guns, mitrailleuses, and rifles, and launched their bombs according to instructions. At least a dozen bombs burst in the Zeppelin works, and subsequent neutral reports stated that much damage was done. Flight-Commander Babington and Lieutenant Sippe got away safely, and returned to French territory with their machines riddled with bullets and shrapnel; but Squadron-Commander Briggs was shot down by the Germans, and, after a gallant fight against odds, taken prisoner. This flight of 250 miles, pene-

trating 120 miles into Germany, across mountainous country and under difficult weather conditions, is one of the finest feats of arms that has as yet been undertaken by aeroplanes in war.

FIGHTS IN THE AIR

With both sides in the Great War equipped with fleets of aeroplanes and airships, fights in the air were to be expected. These, however, have been more numerous and more deadly than was foreseen. As a rule, they have taken place over the German lines, for our men from the beginning carried the war into the enemy's camp; but occasionally British soldiers in France and Belgium have been permitted to witness a struggle between one of their compatriots and an enemy airman. Such a fight is graphically described by an artillery officer in Flanders who saw it at close quarters.

"Thursday morning about eight o'clock," he says, "I heard the aeroplane sentry blow his four whistles. I was just contemplating a bath, and put my head outside to see where the Hun was. The anti-aircraft guns were at him, and getting some in pretty close to him as he came over the battery. I could hear one of our machines up, and, looking round, saw him after the Hun. The anti-aircraft men evidently didn't see him, as they went on firing at the Hun

till one round nearly hit our machine. Then they stopped.

"After that the real fight began. The Hun as usual turned tail (they are much faster machines than ours), but our man had his speed up, and we could hear the two machine-guns crackling up there in the blue—it looked just like two wild birds. Then our machine got on top, and, looking through my glasses, I saw some spars cut away from the Hun and fall. He did a nose-dive, righted himself for about three seconds, and then pitched head first to the ground. Evidently his propeller was shot away too, as his engine was roaring, making a terrific noise as he came down. Both inmates were killed, and the engine went about six feet into the ground. The troops round here all cheered our machine like mad—not that he could hear them. I couldn't help feeling a little sorry for the Huns, but as one of our telephonists said, 'I dunno, sir—he shouldn't try to come and play in our backyard.'"

The dream of all naval airmen during the early months of the

war was to bring down a Zeppelin, but it was not until June 1915 that this difficult feat was actually accomplished. The hero of the exploit, as everybody knows, was Sub-Lieutenant Warneford, a young Anglo-Indian, only twenty-two years of age. From the time that he took his pilot's certificate at the Royal Naval Air Station at Hendon, Warneford had built up for himself the reputation of being absolutely fearless in the air. It is said that on one occasion he flew a new machine from Paris late in the evening, and followed a compass course over the German lines merely to save time. His daring in this respect eventually cost him his life, for it was while making a passenger flight with a new machine in a Paris aerodrome that he was killed, only a short time after his battle with

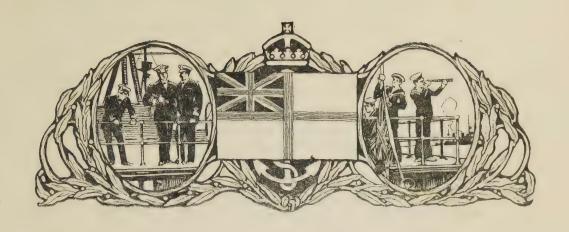
the Zeppelin.

Warneford did not succeed in destroying a German airship at his first attempt. He had been watching his opportunity for some time, and once made a special trip with the intention of attacking a Zeppelin in its home, but to his chagrin found the shed empty. His great chance came at three o'clock in the morning of 7th June 1915, between Ghent and Brussels, when he encountered one of the objects of his search flying at a height of about 6000 feet. Warneford was in a small Morane monoplane, a pygmy of a thing beside the huge sausage-shaped dirigible, but fast and a good climber. He got up above the Zeppelin and started dropping bombs. The sixth bomb did the trick; there was a tremendous explosion, and the airship dropped to the ground, a mass of flames, which did not cease burning till everything on board had been destroyed. So great was the force of the explosion that the little monoplane was turned upside down by it, and though the pilot succeeded in righting the machine he was forced to land in the enemy's country. Happily he was able to put his engine to rights before the Germans appeared on the scene, and in the end he got back safely to the aerodrome from which he had started. Next day it was announced that the King had awarded him the Victoria Cross for his gallant act, and the French authorities also conferred on him their highest military Though he did not live long to enjoy the fruits of his success, his name will go down to history as that of the first pilot to destroy a Zeppelin in the air.

ARMOURED CARS AND ANTI-AIRCRAFT SERVICES

Armoured motor-cars were employed at the beginning of the war to assist the Naval Air Service in land operations, and proved very useful in a number of ways. In August 1914, when Ostend was occupied by a force of marines, a strong squadron of aeroplanes, under Commander Samson, was also sent over, the aeroplanes flying to their destination via Dover and Calais. Supporting these were armed motors, carrying quick-firing guns. Advanced bases were established some distance inland, and on various occasions skirmishes took place between the motor-car supports and bands of Uhlans, all of which resulted in victory for the motors. The presence of the latter was very helpful to the aeroplanes, as they were thus secured against interruption when ascending or descending. Armoured cars also aided pilots who, for any reason, found it necessary to make a forced landing; they carried messages from one point to another, harassed German cavalry patrols, and more than once rendered assistance to the French artillery and infantry. With the introduction of trench warfare their sphere of usefulness came to an end, and, as already mentioned, the corps has now been disbanded.

A new weapon of offence in war usually produces a corresponding weapon of defence, and the reply to the aeroplane and airship is the anti-aircraft gun. Since the Zeppelin raiders became a serious menace, the number of these weapons, as a measure of home defence, has been very largely increased, and they have proved their effectiveness by bring down at least one marauder, which sank off the mouth of the Thames. High-angle guns for use against aircraft are also carried by our armies in the field and by warships of almost every class. They are, however, manned by soldiers and naval gunners, and have nothing to do with the Naval Air Service.



Up till the middle of the last century there was no definite system of training men for service in the Royal Navy. The crew of a warship signed on for the voyage, just as they do in merchant vessels to-day. At the end of the trip they were discharged, and could please themselves as to whether they went back again or not. When the Navy needed more men, they got them from the merchant service; for in those old days the man who could help to sail a merchantman could help to sail a battleship also. Both vessels were built of wood; both were driven by the wind. The only real difference was that the battleship carried guns, but as these were of a primitive nature they could be worked by any intelligent seaman after a short period of training.

With the advent of steam and the adoption of the ironclad type of ship, it became evident to many people that the old haphazard methods of recruiting crews would no longer suffice. Still, the Admiralty were unwilling to make a change. Instead of finding and training their own engineers, they called on the builders of the vessel to supply them. It was the same when other improvements were introduced. If specialists were needed, they were found by private contractors, and though they might work on the ships for

years, the Navy gave them no official recognition.

So things went on until the year 1853, when a Royal Commission was directed to inquire into the whole question of appointments to the Navy. They reported in favour of a system of continuous employment, whereby the Admiralty would take on boys and

train them for the various branches of the Service. This is the system which, with modifications, is in force to-day. It has been found admirably suited to our needs. With the passage of time the work of the Navy has become more and more complicated; Jack, though still a "handy man," is most useful as an expert in one particular branch; and the only way to ensure a continuous supply of experts is to train them from boyhood for the work they will have to do.

The personnel of the modern British Navy may be split up into three main divisions-executive, engineers, and marines. Until the end of the nineteenth century all three classes were trained separately. Cadets who wished to become executive officers were sent to the training-ship Britannia at Dartmouth; engineer students were entered at Keyham College; while marines joined their respective corps and underwent military training on land before being sent to sea. Now all that has been changed. It was found that there was a certain amount of jealousy between the three divisions, who were inclined to look down on one another, so in 1902 the Admiralty decided that all must undergo a common training up to the rank of sub-lieutenant, after which they could specialise in the branch for which they were best fitted. The result of this decision was to do away with class prejudice among naval officers. As all had been trained together from boyhood, no one branch of the Service could consider itself superior to another.

FLAG OFFICERS

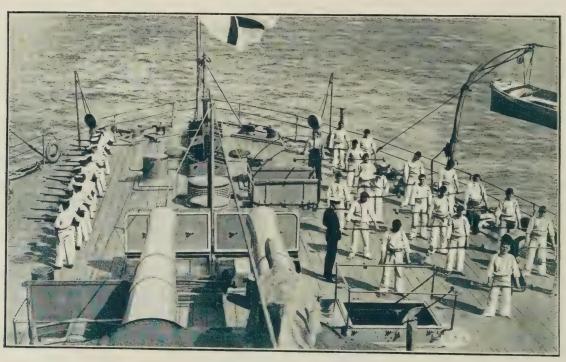
In former times the supreme head of the British Navy was the Lord High Admiral, who under the Sovereign and subject to the control of Parliament could do pretty well as he pleased. This office no longer exists, however, its duties and responsibilities having been taken over by the Board of Admiralty. To-day the highest executive position in the Navy is that of Admiral of the Fleet, a somewhat misleading title, which must not be taken to infer that the holder is necessarily commander-in-chief. As a matter of fact, admiral of the fleet is a more or less honorary rank, held by several different people at the same time. Next in order comes the admiral, and following him the vice-admiral and rear-admiral. Admiral of the

SAILORS HAND-WORKING THE WINCH WHEN THE STEAM BREAKS DOWN.



SCRUBBING DOWN DECKS IN THE EARLY MORNING.

[Cribb, Southsea.



RIFLE AND PHYSICAL DRILL.

[Cribb, Southsea.

Fleet is equivalent to Field Marshal in the Army; admirals rank with generals, vice-admirals with lieutenant-generals, and rear-admirals with major-generals.

Admirals in the Royal Navy are known as flag officers, and the particular ship from which they happen to be directing operations is called the flagship. If an admiral should be in command of a dockyard or some other establishment ashore, his flag would also be hoisted there. An Admiral of the Fleet, if in command on active service, flies the union flag at the main. An admiral's flag consists of a red cross on a white ground; it also flies at the mainmast-head of his ship. Vice-admirals and rear-admirals hoist their flags at the foremast-head. The former has one red disc in the upper inner square of the admiral's flag; the latter, two red discs in the two inner squares.

An admiral who is in command of a fleet or squadron may choose any ship to be his flagship, and may change from one to another as he deems it expedient. He does not, however, interfere with the executive command or the navigation of the flagship, which as at all other times is vested in her own captain and officers.

Admirals of the Fleet are generally retired officers, and it is seldom that one of them goes afloat in active command. The control of an entire fleet in war-time may be given either to an admiral or a vice-admiral, but a rear-admiral rarely commands more than a squadron. There is no fixed rule for such appointments, however. Sir John Jellicoe was a vice-admiral when he was placed in command of the Grand Fleet at the beginning of the war; Sir David Beatty, holding the same rank, was in charge of a squadron under him.

The duties of a flag officer are many and onerous. He is responsible for the whole administration of the fleet or squadron under his command, and must see that the ships and everything connected with them are constantly in readiness for active service. Naturally an admiral commanding in chief must delegate many of his duties to squadron-commanders; but if he is dissatisfied with the way in which his orders are carried out, or the established rules for good order, discipline, and cleanliness observed, he may make a point of inquiring into these matters himself. Flag officers commanding squadrons or divisions of the fleet must personally inspect the state of each ship under their command, and at once report any shortcomings they may observe. They must see that the crews are

properly disciplined, that the stores, provisions, and water do not run short, and that all possible precautions are taken to preserve a good bill of health. But their duties do not end with their own particular command. It may easily happen that during a battle a flag officer will find himself close to a ship belonging to another division of the fleet. In such a case he must pay careful attention to the conduct of that ship, and at the end of the battle report to the commander-in-chief, so that if necessary commendation or censure may be passed. He has also power to send an officer to supersede any captain who misbehaves in battle, or whose ship appears to him to be shirking the fight. If a flag officer is killed in the course of an engagement with the enemy, his flag is kept flying, and signals are repeated by the flagship, just as if he were still alive. The earliest opportunity must, however, be taken to advise the commander-in-chief of the death or total disablement of a flag officer.

COMMODORES AND CAPTAINS

A commodore ranks between a flag officer and a captain. The post is usually a temporary one, and is divided into two classes. A commodore of the first class has a captain under him on the same ship, while a commodore of the second class has not. The former is accorded the rank, pay, and allowances of a rear-admiral, but the latter draws only the pay and allowances of a captain, with such special allowance as the Admiralty may direct. When at sea, both carry distinguishing pennants. Officers put in command of naval barracks are usually given the rank of commodore.

Another temporary rank is that of captain of the fleet, a position equivalent to adjutant-general in the Army. When a commander-in-chief has ten or more ships of the line under his command, a "captain of the fleet" is appointed by the Admiralty to assist him. This may either be a flag officer or one of the senior captains. If the former, he ranks with the flag officers of the fleet; if the latter, he ranks next to the junior rear-admiral, and is entitled to the same pay and allowances. His duties are to issue the orders of the commander-in-chief; to keep a journal of the proceedings of the fleet for transmission to the Admiralty; and to make returns of the fleet to the commander-in-chief.

The captain of a man-of-war occupies much the same position as a captain in the merchant service, though curiously enough he takes no part in the navigation of his ship. He is the man in whom all power is vested; he orders, the others obey. Nevertheless, he is bound by the rules and regulations of the Service as much as the humblest member of the ship's crew. Captain is a distinctive rank in the Navy, but the title is also given in courtesy to the commanding officer of a ship smaller than the ordinary captain's command; hence the old name of post-captain, which meant an officer of full rank, as distinguished from a courtesy captain. A post-captain—for the expression is still used—may be appointed to command various types of war vessel, from a battleship to a second-class protected cruiser. A third-class cruiser or a gunboat is generally placed in charge of a commander, while smaller craft may be left to the care of lieutenants or even sub-lieutenants.

When a captain is put in command of a ship of war he "commissions" her by hoisting his pennant. If the ship is fresh from the dockyard, he at once sets about preparing her for sea, and as a first step towards this end makes a demand on the various departments for provisions, guns, ammunition, and general stores. He also enters such petty officers, seamen, artificers, stokers, and firemen as may be sent to him from the flag or receiving ship. If he is taking over the command from another captain, the matter is much simpler. All he requires to do in this case is to hand a receipt to the retiring captain for the ship's books, papers, and stores, when he immediately becomes responsible for all arrangements on board. The duties of a naval captain, relating to books and accounts, musters, discharges, pay-books, etc., are set forth in a number of Acts of Parliament; but in deciding the best course to pursue for the maintenance of order, cleanliness, and the good health of the crew, he and his officers must be guided a good deal by circumstances. A captain cannot inflict summary punishment on any commissioned or warrant officer, though he can have them placed under arrest until such time as they are tried by court-martial. Members of the crew who misbehave can be punished by order of the captain, or of certain other officers acting with his authority; but the restrictions placed on this privilege nowadays ensure that no man shall ever be punished out of spite, as was the case formerly. All the officers and the whole

of the ship's company are present at a punishment, which cannot be inflicted until twenty-four hours after the offence has been committed. Undue severity is not allowed, and a record of the proceedings must be entered in the log-book and an abstract forwarded to the Admiralty every quarter.

It is the captain's duty to see that the chaplain receives proper attention and respect from all the ship's officers and men, and that divine service is performed every Sunday. He must also cause the articles of war, abstracts of Acts of Parliament for the benefit of seamen, and all orders and regulations for discipline to be hung up in a public part of the ship where the crew can have access to them at any time. The captain has his own quarters on board ship, where most of the entertaining is done. Commissioned officers below the rank of captain live either in the ward-room or the gunroom.

WARD-ROOM OFFICERS

The officers occupying the ward-room of a battleship are the commander, the lieutenants, the marine officers, medical officers, chaplains, senior engineers, and paymasters. Next to the captain, the commander is the most important executive officer; indeed, as has been mentioned, he will often hold the chief command in smaller vessels. On board a battleship the commander acts as chief of staff to the captain, and assists him generally in maintaining discipline and in sailing and "fighting" the ship. In many cases the captain is very little in evidence, the daily routine being supervised by the commander, to whom all sorts of matters are submitted for decision. During the temporary absence of the captain, the commander takes over the control of the ship, and is responsible for everything that is done on board.

On every large warship there is a navigating officer, who may be either a commander or a lieutenant. He cannot, however, occupy the positions of navigating officer and executive officer at the same time. He is entrusted, under the command of the captain, with the duty of navigating the ship, bringing her to anchor, ascertaining the latitude and longitude of her place at sea, surveying harbours, and generally discharging the functions of the ordinary master mariner.

The office of first lieutenant carries with it a list of duties as multifarious as any in the Navy. He is an executive officer in the fullest sense of the word. There is scarcely anything connected with the administration of the ship about which he is not expected to have special knowledge, including navigation, gunnery, and pilotage in their various phases. The lieutenants take the watch by turns, and while on duty are responsible for the command of the ship. A lieutenant must make a note of any important happenings during his watch, and report them to the captain. He must also see to it that all the work of the ship is carried on with the same discipline and punctuality as if the captain himself were present. His place is on the bridge, and he directs the course of the vessel when under weigh.

Of the other ward-room officers it is not necessary to speak here. They are either specialists or non-combatants, whose duties are sufficiently explained by their titles.

GUN-ROOM OFFICERS

A warship's gun-room is the home of the junior commissioned officers, including sub-lieutenants, midshipmen, and naval cadets. It is here that most of the fun takes place on board ship, for youth and high spirits will not be repressed even in time of war. The haughty "sub" may frown his displeasure, but the youngsters are in the majority and must have their fling when work is over.

It is as sub-lieutenants that naval officers begin to specialise in the branch of work in which they are to carve out their future careers. They are not allowed to choose this branch for themselves, but are appointed to do the thing for which they have shown most aptitude. This may seem rather hard, but it will probably be better for them in the end; and, in any case, it is a necessary regulation, because otherwise the Navy might some day find itself with a full complement of officers for one branch and none at all for the others.

Midshipmen as a rule have no particular duties assigned to them. In a small vessel the senior ones may be entrusted with the watch. On a large warship they pass the word of command on board; see that the orders of their superiors are carried out; and accompany parties of men sent on shore. Their work will usually be of a varied

nature, so as to fit them in course of time for the higher ranks of their profession. A boy must serve five years as a cadet and midshipman before he can sit for the examination for sub-lieutenant. Cadets go to sea after they have finished their college training at Osborne, and are drafted only to certain ships.

WARRANT AND PETTY OFFICERS

Warrant officers in the Navy rank after sub-lieutenants, but before midshipmen. They are divided into three classes—gunners, boatswains, and carpenters, the gunners taking precedence of the other two. In the days before the invention of ironclads, only one warrant officer of each class was carried on board even the largest ships. Now, in addition to the chief gunners, boatswains, and carpenters, three or four junior warrant officers are usually appointed to battleships, battle-cruisers, and some other large warships for what are known as quarter-deck duties. Many vessels also carry an extra gunner or boatswain for torpedo duties alone. A certain number of these officers who have duly qualified in navigation are now appointed to command torpedo-boats.

In order to become a warrant officer, a man must pass fairly strict educational and professional tests, and have a considerable length of service to his credit. As a body, warrant officers are very efficient and intelligent men, and many of them eventually obtain commissions.

Petty officers in the Navy have the same standing as the non-commissioned officers of the Army. They are divided into four classes, i.e. chief petty officers, 1st and 2nd class petty officers, and leading seamen, and into two branches, the seamen and the non-combatants. A chief petty officer can only be disrated with the sanction of the commander-in-chief, and if he happen to be a chief engine-room artificer his disrating must be specially reported to the Admiralty. All other petty officers are appointed or disrated by the captain of the ship, except in the case of gunnery or torpedo instructors, who are rated as such for their proficiency in the gunnery and torpedo schools.

It has often been said that the petty officers are the backbone of the Navy. On them depend to a large extent the efficiency and

moral of a ship's company. To-day they are a highly trained and valuable body, and all the warrant officers are drawn from their ranks.

THE SHIP'S COMPANY

A modern warship of the Dreadnought type carries from 750 to 1000 or more officers and men, and is therefore a little town in itself. All the needs of the crew in sickness and health have to be provided for, while the engines, machinery, and guns require constant attention. This means that a warship must carry, in addition to the fighting men, a very large number of people who have no direct connection with the art of making war. In the days of the "wooden walls of England," the ship's carpenter and his assistants were almost the only non-combatants; now we have carpenters, plumbers, painters, electricians, armourers, blacksmiths, coopers, cooks, clerks, paymasters, and a whole host of engineers and stokers, as well as the medical services and the clergy.

To begin with, there are the seamen, who are classified as ordinary seamen and able seamen, according to length of service and ability. They are the fighting men of the ship, and are trained in gunnery and torpedo practice and the use of cutlass and rifle. In war, the ordinary seaman's duties would probably be limited to passing ammunition and making himself generally useful; for modern gunnery is a complicated business, and only experts are entrusted with the actual handling of the guns. Seamen keep the ships clean and ready for action, man the boats, and carry out all the orders of the executive officers. Leading seamen (petty officers) act as overseers in the work of rigging, fitting, and manœuvring, and are required to have an expert knowledge of anchors and cables and rocket apparatus. Seamen gunners are men who have been trained on a special gunnery ship and have thereby become qualified to instruct others. They are given first and second class certificates of proficiency, which carry with them a proportional increase of pay. Before he can earn promotion to warrant rank, a seaman gunner must go through a long course of training, bear a good character, and show considerable intelligence and all-round ability.

In many warships nowadays the engineers and stokers form a larger class than the seamen. This is due partly to the great

increase in speed, which necessitates more men to cope with boiler and engine work and for the monotonous toil of the stokehold, and partly to the fact that nearly everything on board ship is now done by machinery. Some warships have a hundred or more engines for various purposes, including the firing of big guns and torpedoes and the lowering of boats. Skilled mechanics are also needed to attend to gun fittings and accessories and to do repair work.

When the engines are in operation the engineer of the watch must execute promptly all orders he may receive from the officer on deck, reporting at intervals as to whether the engines, force-pumps, hose, and all means for extinguishing fire are in good order. He also makes notes in the steam log of the state of the weather and sea, of accidents to and defects in the engines and their parts, the manner of their working, and the quality of the coal used. He is responsible for any waste of oil, tallow, or engineers' stores, and must keep his subordinates under constant and careful surveillance.

Next in point of numbers to the seamen and engineers comes the artisan class, who comprise pretty well all the trades known to landsmen. It would be impossible to detail the duties of each one here, as these depend on circumstances and the special qualifications of the man. Broadly speaking, artisans in the Navy undertake any work that comes within the scope of their trade or craft. Carpenters and shipwrights are the most favoured, being able to rise as high as the rank of carpenter-lieutenant; armourers can work up to warrant rank, but few of the others ever get beyond that of petty officer.

In the medical section the surgeons are commissioned officers, and are given relative rank with the executive according to their length of service. Nothing need be said regarding their duties, which are those of the ordinary surgeon. They qualify at a university in the usual way, and then, after passing the necessary examination, go to a naval hospital for a short period of training before being drafted to a ship. When a surgeon has served twelve years in the Navy he may be promoted to staff surgeon, or, if he prefers to retire at the end of that time, he is presented with a gratuity of £1500. The men attached to the medical service on board ship are known as sick-berth stewards, and it is their duty, under the surgeon, to attend to the needs of the sick and wounded.



BLUEJACKETS SLEEPING BY THEIR GUNS,



The Royal Marines have a glorious record. Lord St. Vincent said of them, "There never was any appeal made to them for honour, courage, and loyalty that they did not more than realise my highest expectations. If ever the hour of real danger should come to England, the Marines will be found the country's sheet anchor." Yet there is no corps in the whole of the British ranks that is more neglected by the authorities or ignored by the public. "Oh! tell that to the Marines" is a byword expressive of popular disesteem, and when an empty wine-bottle is called a "marine" the joke savours not a little of contempt. Ignorance, sheer blank ignorance, is the explanation. Tommy Atkins and Jack Tar hold the stage, and the audience little knows on how many an occasion have its heroes been indebted for their triumphs and their very lives to the unsung exploits of other heroes behind the scenes.

It was in 1664 that a land regiment was first raised for service in the British Navy, which was then menaced by the growth of French and Dutch naval power. The sailors looked askance at these landsmen, and at first made their lives anything but easy. As time wore on, however, and the Marines or "jollies" were found able to give a very good account of themselves in many a hard-fought action as marksmen on deck or in the tops, in repelling boarders and in tackling the enemy's soldiery when landing parties had to fight in military fashion on shore, Jack's attitude changed. He adopted the marine as a kind of helpless being entrusted to his care—helpless, that is to say, in all sea matters—and in his openhearted way he was good to him even while pitying his want of real

sea-legs and his inability to reef a top-gallant sail. The marine, in his turn, accepted the situation in good part, and when called upon, as was one of his particular duties, to do sentry-duty, he tempered the wind of discipline as much as possible to the shorn (and often tipsy) lambs returning from a frolic with the land wolves in the various ports at which the ship might touch.

The experiment was successful. Marines were enlisted in everincreasing numbers from year to year, until in the days of Nelson there were more than 30,000 in service on the various ships of the Navy. The Royal Marines, as the corps was named, were organised in two divisions, the Royal Marine Light Infantry and the Royal Marine Artillery, under the supreme command of the Sovereign as Colonel-in-Chief; and, although serving in the Navy, they were regarded as part of the establishment of the Army. This, in a measure, explains the notorious neglect with which they were treated. The Army authorities hardly cared to concern themselves very much with a force which, when on active service away from its home stations at Chatham, Portsmouth, and Plymouth, was under the command and at the disposition of naval captains; and the Admiralty, having no responsibility for the organisation, maintenance, and conduct of the force in general, gladly washed their own hands clean. It came about, therefore, that the Royal Marines were, so to speak, wanderers on the face of the earth, doing everywhere whatever England might require—and doing it well.

The rule pretty generally observed was to place a detachment of Marines on board every ship in commission; but when the Great War broke out the number of such ships expanded to so great an extent that an augmentation of the force was called for. This, however, took a modified form. Instead of adding to the numbers of the Royal Marines, a force which, by reason of scanty recognition for so many years, had become exceptionally self-sufficing and jealous of intrusion, the Admiralty decided to create a supplementary force, the Royal Naval Division, which should be a distinct body of troops free from all control by the War Office and available for any land operations in which the Navy might be called upon to take part. Hence the military forces now attached to the Navy consist of the Royal Marines, as before, and the new Royal Naval Division, which, in its turn, comprises the new levies and an attached

Royal Marine Brigade formed of a battalion of the Royal Marine Artillery and four battalions of Royal Marine Light Infantry.

THE ROYAL MARINES AND THE WAR

The famous expedition for the relief of Antwerp had, as its advance guard, a force of some 4000 men drawn from the Royal Marines and the Royal Naval Division, all of whom bore themselves in a manner worthy of the high traditions of their distinguished branch of the service. Not a few were raw recruits, and, in some cases, boys of fifteen years of age; and their equipment was very defective. Yet they went into the trenches on the south of Antwerp and endured the German bombardment with all the steadfastness of veterans. They were unable to sleep, and they were without food, but they gallantly withstood assault after assault. They were all, youths and men alike, sons of whom England might be proud.

In the tragic peninsula of Gallipoli, also, the Royal Marines and Naval Division did more than well, as is witnessed in the following extract from a letter written by an officer of the R.M.L.I.: "After." says he, "the first attack on the lines at the eastern extremity of the Gallipoli Peninsula, the Marine Brigade was ordered to support the Australians, who had already 'made good' and were being heavily pressed at Gaba Tepe. Never shall I forget the thrill of pride as I once again saw the fine old corps in which my grandfather and great-grandfather served and fought, parading for what proved to be one of the greatest efforts they had ever been called upon to make for God, King, and country. Veterans of many fights in various parts of our wide-flung Empire stood shoulder to shoulder with clean-limbed lads of only a few months' service, all of them alert and keen to tackle the job on hand, so much so that a young officer, turning to me, remarked, 'By Jove, one wouldn't think we were going into one of the bloodiest fights in history; just look at them, aren't they great?' And truly they were.

"Here and there, above the din of battle, the voices of officers were heard giving orders and encouraging those who were passing through their baptism of fire. 'Remember the front page of the Globe and Laurel, lads!' shouted a fine old sergeant-major with whom I had served for nearly a quarter of a century. [The Globe

and Laurel is the Corps Gazette, and upon the front page are printed the words of Lord St. Vincent quoted at the commencement of this article.] The scene was awful in its grandeur, yet godlike in sacrifice, and I, who am privileged to write this record, bear witness to the fact, for have I not seen our men glorious in battle, patient in suffering, and splendid in death? Here is just one instance. A young officer is brought down to the dressing-station badly hit, but his only anxiety is expressed in the broken utterance, 'How long will it be before I can get back to my boys?' Poor lad! He never went back. Another picture occurs to me. A young private, who had been shot through the leg, actually broke away from the clearing hospital, and by begging lifts in wagons he at last limped back to his comrades with the single remark, 'I couldn't stick it back there with you boys at the front.' Surely this plain story of the gallant conduct of the Royal Marines will appeal to every one of my fellow-Englishmen and to every Englishwoman as well."

The handling of the Marines in time of war is not a very intricate matter, and does not require the diversified arrangements found necessary for other forces. It is true that if we include the Royal Naval Division in our calculations the case is now different from that of former times. A division is not complete without transport, ambulances, kitchens, engineers, signallers, etc., and even requires the services of cavalry to some extent; so we may yet live to see the appearance in actual flesh of that ancient joke, the "horse marine." Speaking generally, however, it is to be remembered that the Marines are not campaigners on their own account. They are attached to ships of war; that is to say, they are provisioned and "found" in all requirements by the naval supply service, for which their own organisation has not to take any responsibility. And when campaigning on shore, in co-operation with any military force, it is the latter that has to undertake the work of transport and supply. The command of the Marines, therefore, is concerned solely with combatant matters; and this, perhaps, is an explanation of the almost perfect discipline and general efficiency of the force.

Still, when all is said, it must be confessed that the Marines, considered as a distinctive branch of arms, are at length finding their occupation gone. A modern ship of war is not called upon to discharge any duties that require the services of soldiers. Its sailor-

crew is freed from the care of rigging and the handling of sails, yards, Sea-fights are a matter of gunnery without the aid of and masts. small-arms. Boarding has become a story of the past. Bayonet and cutlass drill have lost their meaning so far as service on the sea is concerned. Landing parties alone remain to offer any scope for the action of Marines; and even those operations are now deemed to be within the province of the sail-freed sailors. In the siege of Sebastopol the naval battery served by seamen from the fleet set an example which in after years has been followed and improved upon. The British force in Ladysmith owed its safety to British sailors; and even in the Great War the defence of the Serbian bank of the Danube was entrusted to a like force. The Royal Marines have thus outlived their old-time usefulness. If they are still retained as part of the complements of warships it is in their capacity as military detachments requiring no general base, and thus enabling a fleet to throw a force ashore anywhere at a moment's notice, as it were. In other words, the Marines have ceased to be a part of the ship's company in the full sense of the word; they are virtually passengers, and the meaning of the ship to them is summed up in the idea of transportation. But their noble history still remains as a lasting memorial to the courage and heroism of a unique corps.



THE incidents and upshot of the Boer War at the commencement of the present century led to a wide development of public opinion respecting the true meaning and right appreciation of all that was involved in the phrase "The British Empire." Some forty years before the period in question it had been customary to speak of "England and her Colonies," and to regard these latter as more or less subservient to the former; while not a few leading statesmen, among whom was no less an authority than Mr. Gladstone himself, expressed from time to time an opinion that the self-legislating British territories over the seas were a source of weakness rather than of strength to the mother-country, and should be encouraged to sever the connection and set up for themselves as independent States. But the events in South Africa and, in particular, the action of Canada, Australia, and New Zealand in voluntarily sending contingents to assist the English armies completely altered the situation and the trend of political thought. This change was accentuated by the strenuous efforts made by Germany to establish Colonies and capture trade in all parts of the world under the protection of a navy which was fast being built with the openly avowed aim of putting an end to Britain's supremacy at sea.

A new school of politics came into existence. Englishmen everywhere were admonished to "think Imperially," to recognise the necessity for a closer union between the United Kingdom and its overseas possessions, and to present a single impregnable front to the world at large. We were told to abandon our insular views and standpoint and to take up instead the broad doctrine of equal

rights, equal powers, equal privileges, and equal duties wherever the British flag might be hoisted in all the wide regions of the world. The British Empire, it was declared, should be one and indivisible, without regard to differences of locality or even of nationality. Many countries and races are under the sway of the British Crown: the aggregate area of the lands thus ruled exceeds 13,000,000 square miles; the number of British citizens, of all colours, is more than 434,000,000; more than 42 per cent. of the entire commercial shipping of the world sails under the British flag; more than onehalf of the entire capitalised wealth of the world is owned by the subjects of our King; the British fleet is more powerful than that of any present or past rival; the British armies are capable of what, for all practical purposes, may be termed unlimited increase; the productive ability of the British Empire as regards munitions and war-supplies in general is, when systematically developed and fairly put to the test, greater than is commanded by any other power or combination of powers. If, then, this vast structure were but cemented with the spirit of unity it would assuredly attain to such heights of civilisation, wealth, and beneficent dominion as would ensure not only its own prosperity and happiness but those of mankind in general.

Many steps were taken to bring about the desired union, but in these pages we are concerned only with those that relate to the mutual defence of the Empire against attacks from without. It was felt, after the Boer War, that the time had come for such defence to be no longer left as a load borne-willingly, it is true, but with mighty effort, nevertheless—by the shoulders of the mother-country. From the military point of view, India and the great Colonial States had already done much by raising, equipping, and maintaining local armies; but the most pressing need of the case was seen to be in connection with the Navy. All hostile attacks, other than on Canada by the United States, or on India by Russia, must needs be made by way of the sea; and all help rendered by the Colonies to Great Britain must take the same path. What, therefore, became clearly imperative was to maintain the command of the sea, not merely in the English Channel and in the Mediterranean, but in the South Atlantic and Pacific as well. This involved a considerable addition to the Navy, and as the Dreadnoughts had just come into

existence the first trend of opinion at home and in the Colonies was in favour of funds being voted by those communities for the purpose of constructing Dreadnoughts to be handed over as gifts to the British Navy. The mooting of such an idea was acclaimed with enthusiasm, which rose to a very high pitch on the announcement that a practical beginning had been made, not as might have been expected, by an English-bred population, but by a "coloured" race. The Federated Malay States, governed by native chieftains under the "advice" of a British High Commissioner and Chief Secretary, set an example to the rest of the outlying Empire by subscribing the cost of an oil-fuel, turbine-driven Dreadnought battleship of 27,500 tons displacement and 58,000 horse-power, armed with eight 15-inch and sixteen 6-inch guns, and having a speed of 25 knots. This fine vessel, a sister of the Queen Elizabeth, was given unconditionally, and, under the name of the Malaya, she was placed at the disposition of the Admiralty; but, as a matter of fact, her actual construction was delayed until after the completion of the two Dreadnought cruisers given by the peoples of Australia and New Zealand.

CANADA'S PROPOSALS

When, however, the first transports of delight had subsided, a reaction set in. Canada was proposing to follow and go beyond the example set by the Malay States, Australia, and New Zealand. A proposal was introduced in her Parliament to vote £7,000,000 for building three Dreadnoughts to be given to England; but in the meantime the menace of the submarine had begun to be realised. An opposition sprang up which was finally, and, as the result showed. conclusively, voiced in the Canadian press as follows: "A wilder proposal was never made in all history than to ask Canada to help England by putting £7,000,000 of money into three huge ships utterly unsuited to the requirements of modern naval warfare. With the £7,000,000, Canada could establish well-equipped yards fully equal to the task of building submarine destroyers of the new German type and cruisers for the protection of commerce; and there would be enough money left to provide many vessels of these classes. Such a course would not, perhaps, meet with the approval of the

British Admiralty and their associated firms of shipbuilders and makers of armour-plates and ordnance, who very naturally have looked forward to making a profit of from £1,000,000 to £2,000,000 out of the Canadian tax-payers; but Canada is of age, and is mistress of her own affairs. She has engineers and men of science of her own with whom to consult; her men of business and financiers are as level-headed and shrewd as any that can be found in other countries; her statesmen rank with the best that England can produce. She is not bound by any consideration of circumstance, reason, or common sense to allow any outside authority to dictate to her the steps she should take in order to establish a naval department for her own benefit, and, if need shall arise, for co-operation with the rest of the Empire."

This public pronouncement was followed by the Canadian Parliament rejecting the proposal as it stood, and deferring the whole question of the shape in which aid should be given to the naval side of the Imperial defence. And no further steps were taken in connection with the original agitation for all of the Colonies to act together in creating a Colonial Navy of Dreadnoughts as an addition to the Imperial naval forces.

THE ROYAL AUSTRALIAN NAVY

As regards Australia, though, the whole matter stood on a somewhat different footing. In 1902 an agreement had been entered into between the Imperial Government of the one part and the Commonwealth and New Zealand of the other part, under which a naval force was to be maintained for ten years in Australasian waters by the British Board of Admiralty in return for a yearly contribution of £240,000. This agreement provided also for Sydney being continued as a first-class naval station and for the nomination of cadets in the Royal Navy by the Australian and New Zealand Governments. On the termination of the agreement in 1913 it was succeeded by another known as the "Australian Defence Scheme," requiring the Commonwealth to create and maintain a "Royal Australian Navy" consisting of warships forming an Australian squadron of the Royal Navy under the command of a Commonwealth officer in time of peace, and becoming an integral part of the Eastern Fleet of the



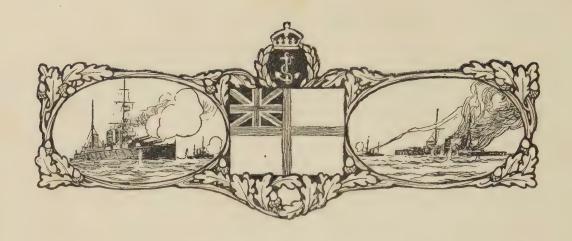
THE FIRST SHIPS OF THE AUSTRALIAN NAVY ENTERING SYDNEY HARBOUR.

Reproduced by permission of the Trustees of the National Art Gallery, Sydney, New South Wales, for whom the Picture was painted. From a Painting by Arthur J. Burgess.



Royal Navy in time of war. All ships of the Royal Australian Navy are known as H.M.A.S. (His Majesty's Australian Ship).

In pursuance of these arrangements the gift-Dreadnought Australia was allocated to the Royal Australian Navy, which, at the commencement of the Great War, also comprised the protected second-class cruisers Melbourne, Sydney, Brisbane, and Encounter, together with the light cruiser Pioneer, a flotilla of six destroyers and two submarines. The cruisers and destroyers were at once employed on active work, capturing Samoa and other German possessions in the Pacific, and convoying the Australian and New Zealand military contingents (the "Anzacs") to Egypt. In connection with this latter service occurred the notable and romantic incident of the battle between the Sydney and the famous German commercedestroyer Emden, which resulted in the latter vessel being completely beaten and forced to run ashore while her adversary escaped practically scathless—a testimony to the fatal superiority of longrange guns and to the skill and seamanship of the commander and crew of H.M.A.S. Sydney. Neptune may be well satisfied with these new bearers of his trident.



At the spring meeting in 1915 of the Institution of Naval Architects, the President (the Marquess of Bristol) referred in his address to the effect of modern armaments on the duration of gunfire. If there was one thing experts were insistent upon at the gatherings of previous years it was that such is the perfection to which big guns have been brought that no naval engagement nowadays could last more than five minutes. Indeed, one of the leading Naval Constructors declared, in the spring of 1914, that the ship that got one shot in first at its opponent would inevitably win the victory. The Marquess of Bristol pointed out how hopelessly wrong these experts have been, since the naval actions of the Great War (up to the date of his address) had lasted not five minutes, but hours.

The experts, however, were not quite so wrong as the President stated. The naval battles of the war had been five in number, namely, the Battle of the Bight, the battle off the Dogger Bank, the battle off Coronel, the battle off the Falkland Islands, and the battle off Jutland; in addition to which there had been one or two single combats such as, for example, the destruction of the *Emden* by the *Sydney*. These had all, without any exception, shown that to establish a winning ascendancy in a naval conflict has now become a matter of getting home the first good hit. The assurance of victory then becomes attainable in the course of a few minutes, even though an hour or two may be required for the complete destruction of the enemy's vessels.

At the conclusion of the naval manœuvres of 1913, a very eminent

British naval officer (who subsequently distinguished himself greatly in action) was asked, "If you found yourself in face of an enemy's squadron, equal in number of vessels, but carrying guns of greater range and power than your own, what would you do?" "I should run away," replied the admiral; and then, looking at his questioner with a quizzical glance in which there lurked the suspicion of a smile, he added, "But I might try a trick or two, all the same."

The whole philosophy of modern naval engagements is summed up in this reply of a hero who was not afraid of seeming to be afraid, or perhaps it would be more correct to say who was not afraid of being afraid. The days of Sir Robert Calder and Lord Nelson have departed. A wooden battleship could be perforated, riven, and well-nigh torn to pieces by a storm of cannon-balls and could still float and sail, and if only she could be laid alongside her adversary she might still hope to win the fight even though she should founder, whilst her crew, as boarders, drove the enemy's complement from their stand on deck. Odds !-- they had to be overwhelming indeed before a British admiral began to weigh chances. But now his very first duty is to do this. When a battle-squadron receives warning from its encircling guard of aeroplanes or destroyers that an enemy force is in sight, the admiral in command has to ascertain the number and character of such vessels and to form an estimate of their respective speeds and gun-power—this estimate being made possible by the information collected in time of peace by the Naval Intelligence Departments of the various nations of the world. Books and lists are issued at intervals, and a part of the professional duty of every superior naval officer is to become familiar with the names, types, and fighting qualities of the several ships comprised not only in his own navy but in all other navies.

It is, accordingly, a fairly easy task for the squadron-commander to reckon up the odds, and to determine whether they are against him or in his favour. He does not pay very much attention to the light cruisers and flotillas of destroyers and torpedo-boats. Even if the enemy's "mosquitoes" should outnumber his own and should carry heavier guns, he is willing enough to take the chance of his units being quicker on the wing, more nimble with their stings, and capable of fighting with more dash and resolution. What really concerns him is the question of what "capital ships"—i.e. battleships

and battle-cruisers—he has in front of him. They are still out of sight from his own bridge and tops; they are as yet some 20 to 30 miles distant; but the observers in his aeroplanes and on board his destroyers have them in view and send wireless messages, giving full particulars as to their appearance and distribution. Many of them can be identified as being well-known individual ships, and the rest can be classified according to type. Our admiral, therefore, knows the speed of which they are capable and the power of the guns they can bring to bear; and as he is, of course, similarly aware of the speed and gun-power of his own vessels, he is able to judge very correctly on which side the Goddess of Victory is embarked.

The case, after all, is not one of very great difficulty. A ship of superior speed and with guns of longer range can obviously remain at a safe distance from her adversary and can destroy the latter easily and certainly. The inferior vessel is powerless. Her men may be far better sailors, gunners, and fighters than those of her assailant, and they may be quite willing to take the chances of rushing in sufficiently close to give play to their smaller guns and perhaps to successfully launch a torpedo. This was what Captain Müller of the Emden essayed when he found himself confronted by the more powerful Sydney. But he was baffled. The Sydney simply stood away and peppered him at her leisure until all that remained for him to do was to run ashore. If, then, in the case we are supposing, the admiral should come to the conclusion that the enemy's force is greatly preponderant in speed and gun-power, even though it may be somewhat less numerous than his own, he will, as a rule, best discharge his duty by steaming away into safer waters and waiting for the fates to be more propitious before he indulges his men with what they are all longing for.

NAVAL TACTICS OF TO-DAY

Let us, however, assume that there does not exist any overwhelming disparity between the two squadrons or fleets. In that case both commanders will decide to fight. But it does not follow that anything like the tactics of the old sailing navies will be employed. The line of battle, the close quarters, the "Nelson touch," and the sweet simplicity of lying alongside the foe, keeping up a fast and

furious fire from port-holes, upper decks and tops, and then grappling and boarding, have all gone into the limbo of the past. A modern naval battle is a very much more cold-blooded affair, even though it calls for loftier degrees of heroism, if indeed it be permissible to speak of degrees in a field of human effort and endurance where, throughout the ages, courage and all that makes for manhood have always attained the zenith.

The commander of a squadron or fleet is always in touch with his captains respecting the part each is to play in any engagement; and this involves the study in advance of all practicable battle formations and the best ways of utilising or meeting them. In all of these discussions the main problems to be tackled are (1) mutual support; (2) maximum gunfire; and (3) superiority at the point of attack.

Mutual support involves the grouping together of ships of similar speed. The vessels of the British Navy, and indeed of all navies, represent many long years of development attended by a gradual advance in engine-power and speed. Hence, while some of the units of a fleet cannot steam at a rate of more than 18 knots, others may be capable of twice that speed, and cannot be expected to relinquish so great an advantage for the sake of remaining in the company of the slower craft. Yet the slow ships may be thickly-armoured, heavily-gunned, and in other respects very powerful fighting machines; so in considering the question of support the admiral has to arrange for his fast vessels to co-operate with each other in attack-manœuvres which shall either hold the enemy until the slow vessels come up or shall "shepherd" the foe into their zone of action.

Maximum gunfire, where single ships are concerned, is a question of the way in which guns are mounted. In the old gun-decks and port-hole days a gun (with the exception of light swivel-mounted bow and stern chasers) could fire in only one direction, and therefore not more than half of the total armament could be brought to bear upon the same target. At the present day guns are for the most part mounted in turrets, cupolas, and casemates capable of being rotated through a semicircle extending athwart the ship; and in the latest models there are two tiers of these casemates. Accordingly the whole of such a vessel's heavy guns can be trained to either starboard or port as desired, and can be discharged in a simultaneous

broadside; an ability which confers a great superiority over a vessel having her guns less advantageously disposed. The admiral will therefore endeavour to pit his double-tiered ships against the restricted gunfire ships of his adversary so as to destroy the latter before he attacks their more powerful consorts.

In the same way he will endeavour to concentrate the fire of several of his own ships upon some single unit of the enemy. This involves the question of "formation"; the cardinal principle to be observed being that no ship must ever be allowed to mask the fire of a consort and thus put the latter out of action for the time being. Conversely the admiral will always endeavour to manœuvre in such a manner that the enemy's ships shall more or less mask each other.

Superiority at the point of attack is, however, the main object to be attained by the disposition of a fleet for battle. Hence an admiral will, whenever possible, strike at the extremity of the enemy's formation rather than deliver his attack on a broad front. The intention is not, as in a land engagement, to turn the hostile flank and advance upon the lines of communication in the rear; for a warship does not receive reinforcements of men and fresh supplies of ammunition during a fight. What is aimed at is to attack and destroy the enemy's fleet ship by ship; a result that must certainly be attained if each of his ships be in turn exposed alone to the combined fire of many assailants for even a few minutes.

In the event of the opposing forces being fairly equal the admiral on being advised of the enemy's presence will at once signal to his fleet to prepare for action and to assume the formation previously agreed upon. He then advances towards the hostile fleet on a course directed so as to cut across the line of retreat likely to be adopted by any enemy ship that may be crippled; and he protects his own flanks and rear against submarines and torpedo-boats by a far-extended screen of destroyers and light cruisers aided by observation from aeroplanes circling overhead. As regards his capital ships he disposes them in three divisions. The first is composed of his speediest ships—his battle-cruisers heavily armoured and gunned—in line ahead; the second comprises his battleships arranged in echelon; and the third is made up of his "slow ducks" in line abreast. Each division is a considerable distance ahead of the next succeeding; and the respective ships of which each consists

are wide apart—the object being not only to secure freedom of gunfire and avoidance of masking, but also to allow even requisite facility for evolutions and manœuvring at full speed.

GUNFIRE

When the leading battle-cruiser sights the enemy, her commander informs the admiral by wireless as to the formation in which the opposing fleet is aligned and as to the position of its various units. He is then instructed regarding the point of his attack, which, if circumstances permit, is directed against a ship with guns of less range than those of his own cruiser division. He opens fire accordingly, gradually drawing up abeam of the advancing enemy, but keeping wide at a distance too great for any effective reply from the latter's guns. The other cruisers follow suit; and as at such a long range the elevation of the guns has to be very great, their shells fly to an immense height in the air before descending on the vessel aimed at. The consequence is that when a hit occurs it is as though the shell falls from the sky on the deck of the enemy's ship. We have all heard of the vast destruction caused by a single shell fired from the great German siege howitzers against the forts of Liége, Namur, Antwerp, and other places-how huge steel cupolas embedded in hills of concrete were, with their guns and garrisons, shattered and scattered and flung into the air. We may, therefore, easily imagine what the explosion of a similar projectile must mean in the interior of a warship. In the first place, as was the case with the first shell that bored its way into the fate-stricken Blücher at the battle off the Dogger Bank, it is almost sure to demolish or disarrange the electric machinery and thus extinguish all lights below. to the darkness thus caused is added a mad medley of devastation. One of the sailors saved from the Gneisenau at the battle off the Falkland Islands was asked what the scene was like between decks when Admiral Sturdee had found the range. "Your first shell," he said, "was a whole thunderstorm packed into one second of time; the next was the roar of all the winds that ever blew; the third made us all, and our poor ship, too, shake and sob and cry in the midst of a black horror that must have come from the Bottomless Pit itself."

This opening attack by the leading cruiser and her consorts is,

of course, responded to. The enemy's ships turn to support their own vessel and to concentrate their fire on the squadron that has assailed them. The cruisers stand away at full speed, and their pursuers become strung out owing to diversities of speed. This is the opportunity for our admiral's second division—his battleships. First one and then another comes into sight, steaming down on the enemy's beam and pouring in a full volume of fire, while they themselves are exposed to but a small number of the opposing guns as the foe is now in a formation advancing across our front in groups of ships that are more or less in lines abreast. The masking thus occasioned would be fatal to the enemy, if allowed to persist. His ships discontinue the chase of our cruisers, and turn to face the newcomers, shaking themselves straight so to say, and thus bringing all their guns to bear, to the extent that their mountings will allow. But all this is a matter of intricate evolutions, and speed has to be reduced to avoid collisions; so that a relatively considerable period of time is required, during which our third division—the slower battleships—has come into action on the rearward extremity of the enemy's new line, while the other extremity is again assailed by our cruisers. It must not, however, be thought that any close action is taking place, or that there is any crowded mêlée such as we may see pictured in the Painted Hall at Greenwich and in other celebrated representations of naval engagements. The several warships are widely dispersed over a large tract of ocean, and a casual observer would fail to detect any order or system in the way they are scattered.

In the meanwhile the small craft have been busy enough. For them it has not been, as with the leviathans, a matter merely of long-range firing and the endurance of shells at first falling from the sky and then, when fired from less distances, razing the decks, tearing the funnels, buckling the masts, smashing the casemates, and pounding the armour-plating on the sides of the ships. They have tasted the joys of actual conflict. They have dashed hither and thither, warding off all attempts to torpedo the big ships they are respectively defending. They have riddled each other's sides with storms of shells from their quick-firers, and have taken a deadly toll of each other's crews with bullets from their machine-guns. Here and there they have not hesitated to ram and board, even though they knew a blast of scalding steam awaited them from the





THE GERMAN BATTLE CRUISE



HER SUNK IN THE NORTH SEA.



pipes and nozzles provided for that purpose. And whenever the least opportunity of so doing has presented itself, they have launched

their torpedoes.

The end of the battle comes when, either by the loss of units or by the exhaustion of ammunition, one side is forced to the conclusion that victory is no longer possible. It then becomes necessary to seek safety in flight with all vessels still capable of full speed, and to

abandon all seriously damaged ships.

A modern naval battle is usually, as we have seen, a foregone con-In no case has human superiority sufficed to make up for mechanical inferiority. And even good marksmanship is of little avail, in many cases, without the accompaniment of good luck. The shell that put Admiral Sir David Beatty's flagship, the Lion, out of action in the battle off the Dogger Bank did not strike any vital part of the ship and did not cause any serious damage, but it happened to strike a small accessory of one of the main engines, which thereupon had to stop. If the first shell fired by the Sydney had not chanced to strike the Emden's fire-control station, the German cruiser would, in all probability, have escaped. In the battle off the Falkland Islands a long-range shell from the Scharnhorst fell towards the deck of Admiral Sturdee's flagship in a straight line for the foremagazine. Just then the forward casemate with its two big guns was being rotated, and the projectile, striking one of the two weapons, glanced off into the sea instead of perforating the deck and exploding the magazine, an incident which, if it had occurred, would have lost us both our famous commander and the victory.

But where the chances of the conflict are not pre-determined by its mechanical features, there still exists ample scope for professional skill and individual character to assert themselves. Very much depends upon the way in which a fleet is handled, upon the efficiency of the engineers and stokers, upon the discipline and handiness of the crew in their several quarters, upon the training of the fire-observers, and upon the steady nerves and clear vision of the gunlayers. These are qualities that have been amply displayed in the British Navy during the Great War, and in no possible modern naval engagement are they at all likely to fail our silent watch of the seven seas.

Abaft.—Towards the stern of a ship. Abeam.—On one side of a ship. See 'Beam."

Accommodation Ladder.—Aladderway or staircase for entering a boat lying alongside a ship, or vice versa.

Admiral.—See "Ranks and Badges." Admiral of the Fleet.—See "Ranks

and Badges.'

Admiralty.—The governing body of the British Navy in the same way that the War Office is the governing body of the Army. The authority and powers of the Admiralty are centred in the "Board of Admiralty," consisting of certain persons who are called the "Lords Commissioners of the Admiralty" and who act by virtue of a "Patent of office" signed by the Sovereign. Up to the time of Queen Anne the Patent was issued to a Lord High Admiral who ruled the Navy; but then the Patent, instead of being made out in favour of a single individual, was issued to a body of Commissioners appointed by the Crown to execute the duties appertaining to the office of Lord High Admiral. The "Board" is composed of (1) a First Lord who, in modern times, is a civilian and a member of the Cabinet; (2) a First Sea Lord who is responsible for the organisation for war and distribution of the Fleet; (3) a Second Sea Lord who is responsible for the manning and officering of the naval forces; (4) a Third Sea Lord who supervises all matters respecting the ships themselves and their equipment; (5) a Fourth Sea Lord who deals with all questions relating to stores and transport; and (6) a Civil Lord who supervises "Contracts and Dockyard Business." In addition there is a Parliamentary Secretary who attends to finance

and, in the absence of the First Lord, represents the Admiralty in the House of Commons; and there is also a Permanent Secretary who controls the internal administration of the Department — all communications from "My Lords Commissioners of the Admiralty" passing through his office and being signed by him.

Advance. - See "Turning Circle." Aerial.—This term is employed to designate the wires that are stretched high up in the air between the tops of two masts or standards to transmit and receive the electrical vibrations (or "etheric waves" as they are also called) that may by certain apparatus be caused to travel through space and that constitute "wireless telegraphy" or "wireless."

Aft.—See "Abaft."

A-lee.—In the direction towards which the wind is blowing.

Aloft.—Up above, i.e. among the masts, sails, and rigging.

Alow. Down below, i.e. on deck or

in the hull.

Amidships. - In the region of the centre of the ship's length.

Answering Pendant. — A long, narrow flag hoisted as an acknowledgment of a signal from an admiral in command of a fleet or squadron. It is first hoisted "at the dip," that is to say, not close up to the masthead or yardarm, as the case may be, to indicate that the signal has been observed. After the few moments required to enable the captain to be sure he has rightly understood the signal, the answering pendant is hoisted "close up."

Armament.—The weapons with which a ship of war is provided. At the present time they consist of guns and torpedoes. The heavy guns intended to pierce the enemy's armour are

termed the "primary armament": while those of smaller calibre and less range provided for keeping up a hail of high-explosive shells for general wrecking and crew-killing are called the "secondary armament." In addition there is an "anti-torpedoarmament" consisting of light quickfiring guns and machine-guns for dealing with the approach of torpedoboats, destroyers, and light cruisers and for firing at the conning-towers and periscopes of submarines whenever visible.

Armour-Piercing Shells. — These have very thick walls (and, consequently, small bursting charges) and are made of the strongest, toughest, and hardest steel that can be produced. It is found that when the point is provided with a soft steel cap the power of penetrating armour is increased from 15 to 30 per cent. above that of the uncapped projectile. As a very rough approximation, it may be said that an 'uncapped' armour-piercing shell can make its way at a range of 2 miles through a plate having a thickness equal to the diameter of the shell.

Astern.—In the rear of a ship.

Athwart.—Across.

At the Pendant." — See "Answering

Auxiliary Vessels.—See "Classification of Ships."

Balanced Rudder.—A rudder which extends forward and not merely astern of its axis of rotation. A balanced rudder can be held in place with very much less exertion than is required in the case of an "ordinary rudder," where the entire area is astern of the axis.

Battleship. - See "Classification of

Ships.' Beam.—Strictly speaking, a "beam" of a ship is a transverse timber or girder that supports a deck. But the meaning of the word is extended to signify the general space alongside; that is to say, the space in the direction of which the beams point. Thus "on the starboard beam" means on the right hand, looking towards the bow.

Bilge.—The lower part of the hull of a vessel.

Bilge Keel. — A longitudinal fin attached to the exterior of the hull not far above the keel. Bilge keels are very effective in moderating the rolling of a vessel.

Bilgeway.—One of the supports on which a vessel rests during building and which slides with the vessel on the "groundways" during launching.

Binnacle.—The protective case in which the steering compass is placed.

Block .- A pulley; that is, a frame containing one or more wheels with grooved circumferences; so that when a rope is rove through the pulley and hauled upon it is supported by the wheel, which revolves and so reduces friction.

Bollard.—A post, usually cylindrical and externally concave, around which a hawser can be wrapped for the purpose of mooring a ship to a quay, etc.

Boom.—A spar or pole that projects outward from the mast or ship's side, etc., against which its inner end rests.

Bow.—The forward extremity of a vessel's hull.

Bowsprit.—The spar or boom that projects from the bow of a vessel.

Brig.-A two-masted vessel carrying square sails on both masts.

Broadside.—The maximum taneous fire that a vessel is able to discharge on one side, i.e. either to port or starboard.

Bulkhead .- A partition. The term is usually applied to signify partitions carried entirely across a ship so as to divide the interior of the hull into a corresponding number of compartments. Longitudinal bulkheads are also sometimes constructed between the several pairs of transverse bulkheads. Any doorways left in the bulkheads to facilitate intercommunication are fitted with doors which can be closed so as to make the several compartments watertight and thus provide protection against foundering in the event of collision, shot-holes, torpedo-attack, etc. A modern battleship has 200 or more compartments.

Buoyancy. - The upward pressure

which prevents a vessel from sinking. This pressure is exerted by the water in which the vessel floats, and is exactly equal to the weight of a mass of water having the same size and form as the immersed portion of the vessel. See "Displacement."

Cable.—Primarily, a rope or chain by which a vessel is attached to an anchor. It also, in nautical language, signifies a length or distance of 200 yards.

Capital Ship.—A battleship. See

Classification of Ships."

Captain.—The officer in command of a ship. See "Ranks and Badges."

Careen.—The immersed portion of the hull of a vessel. To "careen" a vessel is to lay her over sideways so as to expose the lower part of her hull for the purpose of repair, cleaning, and the like.

Catchers.—The name originally given to the vessels now called "destroyers."

See "Classification of Ships."

Cat's Paw.—A gentle breeze just sufficient to produce markings on the

surface of the water.

Chambers.—Tanks fitted to contain water and placed transversely across a ship if it is a heavy roller. When these "water chambers" are partially filled the water moves from side to side as the vessel oscillates, and the effect is to add considerably to the resistance to rolling.

Citadel.—The armoured portion of the hull in vessels where the armour-plating does not extend from bow to stern.

Civil Lord.—See "Admiralty." Classification of Ships.—In the British Navy the following distinctive (or supposedly distinctive) types of

vessels are recognised:

(a) Battleships.—These are known as first, second, and third class, respectively; and some of the firstclass battleships are also known as "Dreadnoughts" or "Super-Dreadnoughts." All are characterised by heavy armour and armament.

(b) Battle-Cruisers.—These are frequently called "Dreadnought Cruisers." There does not exist any good reason for distinguishing them from battleships. Their characteristics are heavy armour and armament and high speed.

(c) Cruisers.—These are the modern substitutes for the frigates and corvettes of olden times. They are subdivided into "armoured" (having "protected plated), sides (having internal armoured decks), and

"light" (unarmoured).
(d) Torpedo-vessels.—These include torpedo-boats, torpedo-boat-destroyers (originally called "catchers"), and ocean-going destroyers. They are not "armoured" or "protected," and their armament is confined to light guns, machine-guns, and torpedoes. Maximum speed and minimum visibility are their main features.

(e) Submarines.

(f) Light draft river gunboats.

(g) Auxiliary cruisers, or "armed

merchantmen.

(h) Special service vessels, such as ships, torpedo depot submarine depot ships, repair ships, distilling vessels, coaling ships, mine-layers, mine-sweepers, surveying ships, etc.

Coaming.—The raised edge that sur-

rounds a hatchway.

Companion.—The hood-like structure built on deck to shelter a ladder-way or

staircase leading below.

Company.—A "ship's company" is the entire aggregate of officers and men on board and belonging to the vessel. is also called the "complement."

Complement.—See "Company."
Compound Armour.—A "compound" plate consists of a back (or foundation) plate of wrought iron faced by a layer of hard steel, the two being fused together. This kind of armour is now, however, superseded by plates of mild steel, which are subjected to a hardening process on one side. There are two of such processes in use - one invented by an American named Harvey, and the other developed at the Krupp works in Germany. The plates are known as "Harveyised" or Krupp" respectively.

Conning-Tower.—An armoured windowed turret in which the captain of a warship may station himself during

an engagement.

Counter.—The upper projecting part of

a ship's hull at the stern.

Crank.—A ship is said to be "crank" when she is easily inclined by external forces. In a "seaway," that is, when waves are travelling athwart the ship, a crank ship is found to be a steady ship.

Crinoline.—Torpedo-netting when in place around a ship is often termed a

"crinoline."

Davits.—Upright bars mounted in sockets near the side of a ship. Their upper ends are curved and are furnished with pulleys for the suspension of a boat which, when the davits are turned so that the curved ends project outward beyond the ship's side, can be lowered into the water.

Depot Ships.—Ships employed to carry stores, fittings, etc., for warships, thereby enabling the latter to be refurnished at sea without having to return to port. See "Classification of

Ships."

Derrick.—A boom the outer end of which is furnished with a pulley or other provision for lifting and sustaining weights which can thus be moved from place to place by corresponding movements of the derrick.

Displacement.—The weight of water reckoned in tons which a ship displaces when she is floating freely and at rest. It is equal to the total weight of her hull, masts, and rigging, and

everything she carries.

Dog-Shores. — Timbers employed to hold the "bilgeways" in place while a vessel is being built. They are knocked away when the time for launching comes, and then the bilgeways carrying the vessel are free to slide down the "groundways."

Draught. — The depth to which a

Draught. — The depth to which a vessel is immersed when floating. It is the vertical distance between the bottom of the keel and the plane of

the water-line.

Effective Horse-Power.—That part of the power exerted by a ship's engines which is utilised in the actual propulsion of the vessel. It varies,

according to circumstances, from 30 to 60 per cent. of the "indicated horse-power," that is, of the total power developed by the engines and measured by certain instruments called "indicators."

Ensign.—The national flag hoisted at

the stern of a vessel.

Evolutions.—Changes in the "formation" of a fleet or squadron; that is to say, changing the order in which the ships are arranged, as, for example, from "line ahead" to "line abreast,"

and so forth.

"Excellent."—There is a ship of this name which is ranked as a gunnery school. She is stationed at Whale Island, Portsmouth, where all gunners are trained for the British Navy in a vast establishment which may properly be regarded as a Technical University. The officers and men, while they are going through the school, are officially considered as being "on the books" of H.M.S. Excellent.

Exercises.—The periodical training in "evolutions" to which all fleets and squadrons are subjected. See "Evolu-

tions."

Fathom.—The unit of length (=6 feet) adopted by seamen generally for ex-

pressing the depth of water.

Fire-Control.—The system now generally adopted for rendering the fire of a ship's guns accurate and effective by means of observing stations from which the distance and direction of the enemy may be ascertained, and from which, also, the observers may note the hits and misses of their own gunners. The information thus obtained is signalled from minute to minute to the officers of the several guns who train and elevate their weapons accordingly. First Lord.—See "Admiralty."

Flag Officers.—Admirals of the Fleet, Admirals, Vice-Admirals, and Rear-Admirals, all of whom are entitled to signify their presence aboard by flying a flag in addition to the national

ensign at the stern.

Flagship.—The vessel in a fleet or squadron which carries the flag of the commanding admiral.

Fleet.—An assemblage of warships comprising more than one squadron.

Flooding.—The intentional admission of water into any compartment of a ship for the extinguishment of fire or any other special purpose.

Flotilla.—An assemblage of small vessels as distinguished from battle-

ships and cruisers.

Fo'c'sle.—The contraction usually employed by sailors when they speak of the forecastle.

Fore-and-Aft.—In the direction of the ship's length from bow to stern.

Forecastle.—The upper portion of the hull of a ship at the bow end. In olden times this was built up into a fortified structure. Hence the name.

Forward.—In the direction of the

ship's bow.

Fouling.—This word, according to circumstances, may mean either entanglement (as of a ship's screw by a rope) or an accumulation of weeds, barnacles, etc., on a ship's hull.

Freeboard.—The distance between the

water-line and the gunwale.

Girdling.—A belt of timber sometimes placed round a ship's hull to obtain

greater stability.

Grand Fleet.—The name adopted by Admiral Sir John Jellicoe for the naval force under his command in home waters and the North Sea during the Great War.

"Green."—To "ship it green" means when a vessel takes a full wave on

board.

Gunwale.—The top of the sides of a vessel.

Gyro-Compass.—A steering indicator in which the index is kept pointing true north by the operation of a gyro-

scope.

Gyroscope.—An instrument composed essentially of a quickly-rotating heavy disc or heavily-rimmed wheel. Its tendency is to maintain its plane of rotation parallel to the original direction—a tendency which is availed of for the control of the index needle in a compass, or for actuating the rudder of a torpedo.

Halyard.—A rope used for hoisting

purposes.

Hatchway.—An opening in the deck of a vessel for the purpose of access to the interior of the hull. It is bordered by a raised edge called the "coaming," and over this is fitted a lid or cover called the "hatch."

Hawsehole.—An opening near the bow of a ship through which there passes the cable attached to the anchor.

Hawser.—A large rope or hempen cable.

Heel.—Inclination from the vertical.
When a sailing-ship has the wind abeam
she "heels over," that is, she assumes a
sloping instead of an upright position.

Hog.—When the centre of a ship's hull is supported and the bow and stern are unsupported the latter tend to droop and the ship is "hogged." If the ends be supported and the centre be unsupported, it is the latter that tends to droop and the ship "sags." These hogging and sagging strains are easily brought about by waves, and must be provided for in the design and structure of the hull.

Horse-Power.—The unit employed in stating the power of steam-engines and other motor machinery. It means a force capable of raising a weight of 33,000 lb. to the height of 1 foot in 1 minute of time; which, from the mechanical point of view, is the same thing as raising 550 lb. 1 foot high in 1 second, or 5½ lb. 200 feet

high in 2 seconds, and so on.

Hull.—The body of a ship as distinguished from its masts and equipment.

Hydrographer of the Navy.—The head of the Hydrographic Department entrusted with the duty of carrying out marine surveys and preparing charts.

Indicated Horse-Power. — The amount of force which an engine exerts as shown by measuring instruments. Part of the indicated power is absorbed by the friction of the engine itself, and is thus not available for outside work. In the case of a marine engine, part of the indicated power is also absorbed in overcoming the

friction of the propeller blades in the water and in imparting a rearward velocity to the water (the "slip" of the screw). These and other wastes greatly reduce the proportion of the "indicated horse-power" available for the propulsion of the ship. See "Effective Horse-Power."

Keel.—In the days of the old wooden ships the keel was a massive central longitudinal timber forming a kind of backbone to which "ribs" were fastened at intervals. In modern times the keel is a bottom floor or platform on which the superstructure of the hull is built.

Kingston Valve.—A valve placed in the flat bottom (or "keel") of a ship and communicating with the water below. It is used for supplying water to pumps on deck and also for admitting water to any compartment, the flooding of which is desired.

Knot.—The naval unit of speed, one knot signifying a speed of one seamile (6080 feet, as distinguished from the land mile of 5280 feet) per hour. Frequently, however, the word "knot" is used to mean simply a distance or length of 6080 feet.

Lanyard.—A short piece of cord for tying on any article, such as a knife, etc.

Lee.—In the direction towards which the wind is blowing. The direction from which the wind blows is called the "weather side."

Lieutenant. — See "Ranks and Badges."

Lieutenant - Commander. — See "Ranks and Badges."

Line Abreast.—Vessels in a side-byside position.

Line Ahead.—Vessels following each other in file.

Load Draught.—The depth of immersion for which a ship is designed.

Load Line.—The line marked on the exterior of the hull showing the permissible immersion. In the case of merchantmen there are more than one of these lines, it being considered safe to load a vessel more heavily in summer than in winter and in fresh water than in sea water.

Lord High Admiral. — See "Admiralty."

Magnetic Compass.—A steering indicator composed essentially of a magnetised steel bar which tends to maintain a position parallel to the earth's magnetic axis, this latter not coinciding with the axis on which the earth rotates, and varying slightly from year to year.

Main Deck.—The deck next below the

upper deck.

Manœuvres.—Mimic warfare periodically practised by all fleets in order to familiarise the officers and men with the handling of fleets, squadrons, and ships for the purposes of real war.

Man-Rope.—A rope serving as a rail or bulwark for the sake of protection, as, for example, the rope that forms the rail of an accommodation-ladder.

Mariner's Compass. — A compass, whether magnetic or "gyro," furnished with a circular scale divided into 32 "points," each of which has a special name, as "north," "north by east," "north north-east," "northeast by north," "north-east," "northeast by east," "east north-east," "east by north," "east north-east," "order east by north," "east." To recite the whole 32 names in their regular order is known as "boxing the compass." A "point" is, of course, the thirty-second part of a circle, that is to say, it corresponds to turning through an angle of 11½ degrees.

Master-Compass.—The main gyrocompass which governs the action of other compasses distributed through-

out a ship.

Masthead Angle.—The angle subtended by the height of a masthead from the water-level when viewed by a distant observer through a sextant. When a ship is engaged in exercises she is furnished with a table of masthead angles of all the ships in company for all such distances as are likely to be required for the purposes of "station keeping." By observation of the masthead angle of the ship at the head of the line, a ship can always find her own station in the line.

Mate.—See "Ranks and Badges."

Metacentre.—The point at which the upward force exerted through the centre of buoyancy of a vessel when more or less heeled over intersects the line passing through the centre of buoyancy and centre of gravity when the vessel is at rest.

Midshipman. — See "Ranks and

Badges."

Monkey's Island.—A bridge or observation platform situated above and outside the conning-tower.

Naval Division.—A new force organised on military lines and created since the beginning of the Great War. It was first employed (in an immature state) in the abortive expedition to

relieve Antwerp.

Navy Board.—In olden times, and, indeed, up to 1832, English naval affairs under the supreme control of the Lord High Admiral or the Lords Commissioners were administered by two governing bodies, namely, an "Office of Admiralty" that dealt with active service requirements and a "Naval Board" that dealt with the civil departments connected with the Navy. In 1832 an end was put to this dual control, and the "Board of Admiralty" replaced both of the governing bodies in question.

Oil-Fired.—This phrase is used to distinguish a ship of which the steamboiler furnaces are fed with oil as a fuel instead of coal.

Painter.—A rope fastened to the bow of a boat with which to tow or fasten it.

Pendant.—A long, narrow flag.

Pennant.—A single rope which is pulled

by a "tackle."

Periscope.—An upright tube the top of which carries an inclined mirror reflecting the image of external objects downwards through lenses which produce or picture on a table-screen underneath the bottom of the tube. Periscopes are used by the commanders of submarines, who can thus see ships and other objects without bringing their own vessels to surface.

Petty Officers.—Naval officers who

are appointed by their commanders and not by royal commission or warrant. In a general way they are analogous to the N.C.O.'s of the Army.

Pintles.—The downward-turned pins at the rear of an ordinary rudder which fit into lugs on the rudder post and thus enable the rudder to be easily

shipped or unshipped.

Pitching.—The downward or diving motion of a ship's bow when actuated by waves travelling in the direction of its length. The corresponding upward or rising motion is termed "'scending," by way of contraction for ascending.

Port.—The left-hand side of a vessel

facing the bows.

Post Captain.—The old term for the captain of a ship in the Royal Navy. It was never an official designation and originated from the fact that when an officer was appointed to command a ship he was posted in the Admiralty's books as her captain.

Protected Ships.—Vessels without side armour, but having a protective

deck.

Protective Deck.—A deck plated with steel (frequently 3 inches thick) for the purpose of keeping out descending shells.

Quarter Bill.—A document by which there is assigned to every officer and man on a warship his exact station in the event of an engagement, and also in all drills, evolutions, and emer-

gencies.

Quarter-Deck. — Formerly this was the poop-deck, that is, the raised deck that surmounted the "poop" at the stern of the vessel. It is now any part of the upper deck of a vessel that is chosen as the station of the commanding officer. The customs of the Navy require that every officer and man shall salute the quarter-deck on arriving at that "sacred spot."

Quarters.—The stations assigned by the "quarter bill." To call a crew "to quarters" means that the officers and men are to go to their respective

stations.

Ram.—A projection of the bow below the water-line, intended to pierce the

enemy's hull by intentional collision. Modern warships are no longer provided with these weapons now that long-range gunnery is the deciding factor in naval battles.

Ranks and Badges.—These in the British Navy are as follows:—

Admiral of the Fleet—

Corresponds to the rank of Field-Marshal in the Army. Badge: a broad gold lace stripe, a narrow stripe with a curl, and three narrow stripes between the two.

Admiral-

Corresponds to the rank of General in the Army. Badge: a broad gold lace stripe, a narrow stripe with a curl, and two narrow stripes between them.

Vice-Admiral—

Corresponds to the rank of Lieutenant-General in the Army.

Badge: a broad gold lace stripe, a narrow stripe with a curl, and one narrow stripe between them.

Rear-Admiral—
Corresponds to the rank of MajorGeneral in the Army. Badge:
a broad gold lace stripe and a
narrow stripe with a curl.

Commodore—

Corresponds to the rank of Brigadier-General in the Army. Badge: a broad gold lace stripe with a curl.

Captain—

Corresponds to the rank of Colonel in the Army. Badge: four narrow stripes and a curl.

Commander-

Corresponds to the rank of Lieutenant-Colonel in the Army.

Badge: three narrow stripes and a curl.

Lieutenant-Commander-

Corresponds to the rank of Major in the Army. Badge: two narrow stripes and a curl, with a half-width stripe in between.

Lieutenant-

Corresponds to the rank of Captain in the Army. Badge: two narrow stripes and a curl.

Sub-Lieutenant-

Corresponds to the rank of Lieu-

tenant in the Army. Badge: one narrow stripe and a curl.

Mates-

These are promoted from "the lower deck," that is, from the men as distinguished from the officers of a crew. They correspond to the rank of Sub-Lieutenant in the Army.

Warrant Officers-

They hold their positions by royal "warrant" instead of by royal "commission," and they correspond to the Sergeant-Majors and other warrant officers of the Army. They are of many types and gradations, including such varieties as gunners, boatswains, carpenters, electricians, head stewards, and instructors in cookery.

Midshipmen.
Naval cadets.

Engineer officers of ranks as above wear their stripes on a purple ground, which changes to white for paymasters, red for surgeons, and blue for naval instructors. A midshipman wears three buttons on his cuff and white tabs on his coat front. Junior gunners and boatswains wear three buttons on their cuff. Senior gunners and boatswains have a narrow gold stripe (with a curl) above the three buttons; while, in the case of chief gunners and boatswains, the stripe is broad.

Ratings.—The classification, for rates of pay and allowances, of men and petty officers in each branch of the service.

Rear-Admiral.—See "Ranks and Badges."

Rolling.—The oscillation sideways of a vessel.

"Round-up." — The curvature or camber "given to the upper surface of a deck, hatch, etc., for the purpose of shedding water.

'Scending (sometimes written "Sending").—See "Pitching."

Scuppers.—Holes cut through the side of a ship at the edge of the upper deck to enable water to run off the deck.

Scuttles.—Holes cut in the decks or sides of a ship as, for example, hatches

and portholes.

Seaway.—In the direction of the crests and troughs of the waves, as when waves are travelling athwart the course of a ship. See "Crank."

Sextant.—An optical instrument for

measuring angles.

Sheer.—The curvature of a hull when the bow and stern are constructed so as to be higher than the "midships" or "waist.

Shrouds.—The ropes by which a mast is held in place, such ropes being attached to the ship's sides. All other maintaining ropes for masts, funnels, etc., are usually termed

"stays.

Skin Friction.—The resistance to a vessel's progress arising from the rubbing of its hull against the water through which it is passing. The smoother and cleaner and more polished the surface of the careen (see "Careen"), the less is the resistance due to skin friction. But under the most favourable circumstances skin friction diminishes a vessel's speed very much more than all other resistances put together.

Stability.—The degree to which a vessel resists any force tending to upset it. A ship is completely "stable" when its design and lading are such that it tends to resume an upright position even when almost on its beam end. It is "unstable" when it tends to capsize or "turn turtle" on being much inclined. The through which it can roll before becoming unstable is its "range of stability." See "Crank."

Starboard.—The direction of the right hand when looking towards the bow.

Stays.—See "Shrouds."

Strake.—A line of plating or planking in the hull of a ship parallel to the keel.

Stretchers.—Rests for the feet of rowers in a boat.

Swab.—A mop made of strands of twisted twine or shreds of cloth or other like substances.

Tackle.—A combination of two or more pulleys and ropes arranged for effecting a pull with more or less of mechanical advantage.

Tactical Diameter.—The distance between the advance and return courses of a ship when she turns completely astern.

Thwarts.—The transverse seats of rowers in a boat.

Thwartships.—Across, from side to

Tiller.—The bar by means of which a rudder is turned.

Tonnage.—The size of a vessel as expressed in terms of displacement.

Trim.—The position of a ship's hull in the water with regard to its verticality and horizontality.

Turbine.—A motor actuated by the passage or escape of steam, water, or some other vapour, gas, or liquid through or from blades or orifices in the circumference of a wheel.

Turbine-Driven.—A ship of which the

propelling engine is a turbine.

Turning Circle.—The curve described by a ship that is steered so as to turn

completely round.

Turret.—A casemate for a gun placed on the upper deck and capable of being rotated so as to have an arc of fire extending from starboard to port.

Vice - Admiral. — See "Ranks and Badges."

Waist.—The portion of a vessel's body situated between the forecastle and the poop, i.e. the "midships" portion.

Wake.—The temporary track of disturbance left on the surface of the water by the passage of a ship.

Warp.—A rope or chain of any kind when used for moving a vessel.

Warrant Officers.—See "Ranks and Badges.'

Watch Bill.—A document by which the stations and times of duty of all officers and men of a warship are assigned for the ordinary work of the vessel.

Whale Island.—See "Excellent."
"Wooden Walls."—The popular phrase that was used to designate the British Fleet when its ships were built of wood,

